

MOTOR AGE

Vol. XXIX
No. 14

CHICAGO, APRIL 6, 1916

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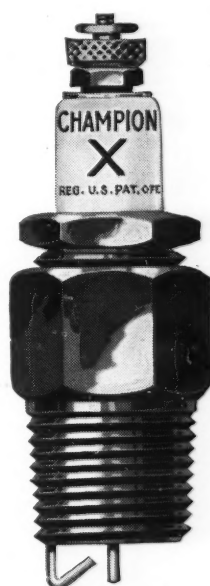
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MOTOR AGE



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ANNOUNCEMENTS

In "Trailing the Old National Pike," which will be the feature article of Motor Age for April 13, Robert Bruce gives a graphic picture of one of America's first attempts at systematic highway scheme as it is today. Mr. Bruce has made four trips over this route in the interests of the Automobile Blue Book and his observations and photographs are interesting and instructive.



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One of the towns has 40,474 residents—lies close to Philadelphia—has a fine harbor and excellent railroad facilities. And is a most important manufacturing community—the centre of the steel casting industry and the home of many large factories.

Another of the towns has 18,645 inhabitants—located not far from Pittsburg on three railroads. Is the centre of the Pennsylvania oil industry and has in addition many manufacturing establishments.

Another shows 20,935 residents—lies close to Pittsburg—has three railroads running thro' it—the home of one of the **GREAT** steel mills. Extremely active community and a good opening for a progressive man.

Such are three of the Studebaker opportunities in Pennsylvania alone. Each of the towns briefly touched on is a hustling business community, sharing heavily in the country's increasing prosperity with more people today able to buy cars than ever before. One town, for example, reports savings deposits of over **ELEVEN MILLIONS**. Each offers a **GREAT** opportunity for a live man with the Studebaker line. Write for details.

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MOTOR AGE

TIRES

Their Care and Repair - A Running Story

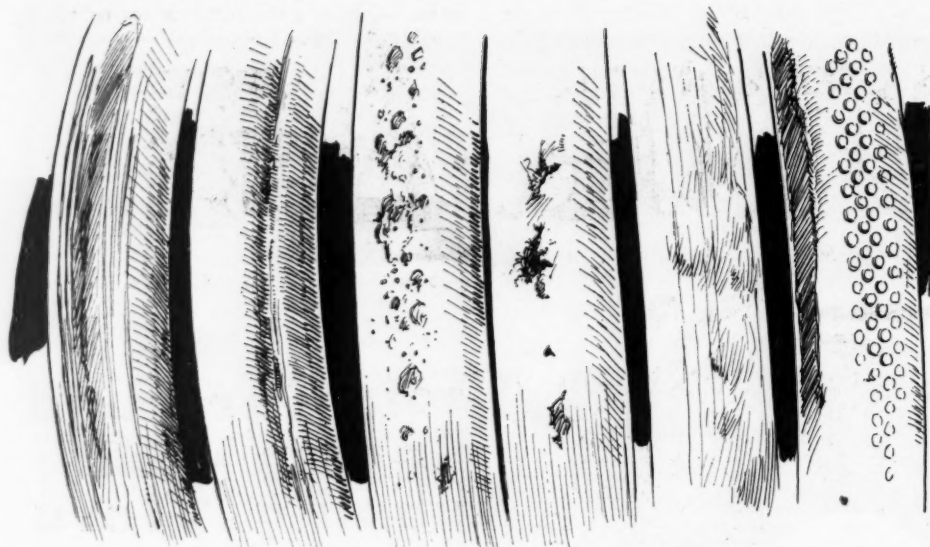
By Darwin S. Hatch

Editor's Note—Herewith is presented the first of a series of articles on the care of tires. These articles are intended primarily for the car owner and will tell him how he can increase the mileage of his tires. The accompanying installment is a general resume of some of the more general factors governing tire life and the bases of adjustment upon which the different tire manufacturers make replacements. The first installment is intended simply as an introduction to the general subject of the care of tires and many of the considerations touched upon here will be taken up in more detail in later installments. Every reader driving a car has had experience in which many miles of useful life have been cut from the tires by some carelessness or neglect. These readers perhaps can tell how a thousand miles may be added to the life of the tire by giving it human attention. Readers are invited to express their opinions on suggestions arising out of this series and to contribute their advice on this subject.

MOTORISTS who fail to obtain at least 3,500 or 5,000 miles of usage from first-quality tires of standard make puncture their bank accounts needlessly. While the tacks of neglect and carelessness spring leaks in mileage and raise sand blisters on the cost of upkeep.

Tires are made of fabric and a composition of rubber and minerals and it may be easily understood that the materials used for their construction are not of the durability of stone or the strength of steel. They are made of material which will make smooth, comfortable riding and to save the car and its occupants from the effect of jars, occasioned by unevenness in the road surface. They are designed to absorb as far as possible the shocks due to ruts, stones and other inequalities of the surface upon which the car rides and it is foolish to expect that they can be made to do this work and at the same time last indefinitely without attention. They should be given an inspection very frequently for signs of injury and when such signs are found should be given the care





Adjustments are made not on the basis of the actual mileage as a set figure, but upon the evidence offered by the tire itself as to the conditions of use and the service it has given

the injury seems to warrant at the time.

Physicians say that practically every ailment of the human body can be remedied if correctly diagnosed and the treatment begun before the trouble has been allowed to progress too far. Tire treatment must be carried out on the same basis. Though diagnoses of ailments of casings is not so difficult a matter as that of the human body, the determination of whether or not the tire is worth the expenditure of money to repair in the case of serious damage requires a very thorough inspection.

Wait Too Long for Inspection

The chief trouble with tires that are turned back to the tire company for adjustment or turned over to a tire repairman is that the owner usually waits until tire inspection becomes a post mortem examination rather than a clinic. No more can be done for a tire after its heart, the fabric, is gone than can be accomplished toward saving a man whose heart has stopped beating—and there is no pulmotor to resuscitate the defunct tires. If a pump had been used to give them more air while their organs still were in operation, there would be a greater number of them still on the road.

The fact that the individual care which a tire receives at the hands of its owner and the individual conditions under which it is operated have an enormous bearing on the life of the tire is most strikingly illustrated in the decision of a number of the large tire manufacturers to discontinue the mileage guarantee of 3,500 or 5,000 miles as the case may be and base their adjustment upon the actual condition of the tire and the service which it has given rather than the actual number of miles it has run.

In explaining this method, let us quote the Goodyear Tire & Rubber Co., upon this question. A statement of this tire maker is as follows: "Adjustments on the different types of our tires are based on the merits of each particular case rather than

on any definite time or mileage basis, the idea being to handle each adjustment to the satisfaction of the customer. If a tire is presented to us and if it isn't perfect in the least, we adjust it. The basis on which we adjust depends on various things, such as the care with which it was used, the service which still remains in it, etc.

"Obviously a motorist who gives his tires proper care and attention should receive adjustments on an imperfect tire on a higher basis than that used in dealing with one who pays little or no attention to them.

"By avoiding a fixed mileage basis for adjustment all defective tires regardless of usage we are able to handle any tire that may be defective on a basis fairer to the individual owner. To the careful driver, we can adjust on the basis of the service he might reasonably expect. To the less careful man, we can adjust on a basis fair to him considering his treatment of his tires. Thus the careful driver pays no tax for adjustment made to his less careful neighbor."

In commenting on this adjustment situation, the Michelin Tire Co., makes more clear just what was meant in the preceding statement by making the careful driver pay no tax for adjustments made to his less careful neighbor. The Michelin company says that, "Owing to the almost endless varieties of conditions capable of affecting the life of a pneumatic tire, not only as regards road surfaces in different localities and at different seasons of the year, but also in respect to the individual treatment each tire receives and the accidents with which it may meet, we claim it is impossible to guarantee that any tire will run a stated mileage and still be scrupulously fair to all consumers.

"In order to give such a guarantee and carry it out, it would be necessary to set aside a considerable sum of money to back it up, which sum of money could only be obtained from the pockets of the consum-

ers generally, either in enhanced prices or by a reduction in manufacturing costs and consequently in the quality of the product. It is not possible to give more than 100 cents for a dollar and we figure that we can serve the consumer better by giving him all his money's worth in tire value rather than be selling him insurance. This, of course, does not affect the implied guarantee of quality which covers all goods bearing the name of Michelin."

The Firestone Tire & Rubber Co. does not give a definite mileage guarantee but guarantees all of the tires to be free from imperfections in material and workmanship. If examination shows that the tires are defective they will be repaired or replaced and when replaced charge is made to owners at the time new tires are delivered for such amounts as will compensate for the service rendered by replaced tires, but tires worn out in usual or unusual service, abused knowingly or unknowingly, misused or used on improper rims are not covered by the guarantee. And any guarantees are expressly waived by any purchaser who uses therein any substitute for air or who uses them under weights in excess of those for which the various tires are recommended or who does not keep the tires inflated to the pressure recommended by the manufacturers. Republic, Fisk, Falls, Swinehart, Norwalk, Carspring, Dayton, Vitalie, Knight, Batavia, Federal, Ten Broeck, Capitol, Miller.

No Set Time for Adjustment

The Combination Rubber Mfg. Co. has no set time or period that eliminates the adjustments of the tires. The looks of the tire when returned for adjustment is the criterion upon which adjustments are made. There are a number of other tire manufacturers whose adjustments are made not on the basis of the actual mileage as a set figure but upon the evidence offered by the tire itself as to the condition of use and the service it has given.

On the other hand, there is a large proportion of tire makers who make adjustments upon a definite mileage basis, but the care which has been given the tires and any unusual conditions of use are taken into consideration just as surely under this plan as they are under the plan which does not consider a definite number of miles of life.

Lee puncture-proof tires have this definite guarantee carried out to the greatest extent. All the tires are guaranteed to give 3,500 miles of service without puncture and if punctured under 3,500 miles by any object which penetrates the inner tube, a refund is made varying from \$6 for a 3-inch tire to \$14 for a 5½-inch tire, and, in addition, the tire is repaired free of charge. The most common mileage adjustment is on the basis of 3,500 miles, such as Goodrich, Usco, Nassau, etc., but there are a number of tires upon which the mileage guarantee is extended to cover 5,000 miles. Among these are the U. S., Ajax, Pennsylvania

Victor, the Empire red tire, the National, Standard, Alliance, and a number of others. Penna., Kelly-Springfield and Globe tires are guaranteed for 6,000 miles. Kelly-Springfields, in Ford sizes, for 7,500 miles. Ohio tires carry a 4,000-mile guarantee. Wilson's are guaranteed for 10,000 miles.

It is pretty evident, therefore, that aside from the annoyance caused by a blowout or tire trouble of any kind, there is an actual dollar-and-cents saving made by seeing that proper care is taken in the tires, no matter under what method of adjustment or guarantee they may have been purchased. Also it is quite true that the character of the roads upon which the tires are used has a distinct bearing upon their life and thus upon the tire upkeep cost to the owner. Practically all of the manufacturers have the same policy in one section of the country as another, as regards their adjustment, and if the quality of roads over which they are used is considered, it is only incidental as determined by its effect on the shortened mileage of the tire when brought in for adjustment. Even in those cases where there is no definite mileage guarantee, the nature of the roads in various localities naturally will affect the individual adjustments to a greater or less degree.

Macadam Hard on Casings

It is the experience of most tire manufacturers that tread wear is faster in localities where hard macadam roads are present. This is partly because of the higher average speed made on such roads and also upon the cutting effect of the sharp stones. Smooth dirt roads usually render better mileages than do the hard macadam roads. In general, however, tires which are driven on smooth streets or boulevards naturally will give considerably greater mileage than those used on rough streets or on sharp rock roads.

Of course the state of the road in regard to loose objects and surface holes has considerable bearing on the ultimate life of the tire; in fact, the pneumatic tire's reason for existence lies in its ability to absorb the shocks consequent upon irregularities in the road surface, whatever their nature, and it follows, as a matter of course, that the principle determining factor in the life of a tire is the frequency and degree of violence with which these obstacles are encountered.

Poor roads, no matter what their construction or surface material, are a shortener of tire life; for instance, the Empire tires in the northern part of this country show a very much greater mileage than they do in the southern territory where the roads as a whole are poor.

Go and talk to a tire man about troubles and ninety-nine times out of a hundred his first words will be, "Keep them pumped up." According to all the customs of tire writing, that sentence should be emblazoned in glaring capitals at the top

of the first page, for tire inflation is the keynote of tire service. This subject has been enlarged upon so frequently that it is only necessary to reiterate tire makers' injunctions to keep the inflation pressure up to that recommended by them.

Just a hint here, do not try to make the tire men believe that you have not been running with soft tires if the contrary is the case, for they can read the history of the tire from its appearance

Care Means Mileage

Rubber tires have four natural enemies—light, heat, oil and water. Light and heat affect the rubber chemically. Oil rots the rubber. Air rots the fabric.

Keep iron rust off the rims, as it rots the canvas. Paint the rims with shellac or graphite.

Casings wear badly if wheels are not parallel or if the steering connections are loose.

Careless driving is responsible for tire trouble. Quick starts and stops put too sudden strains on tires and cause casings to wear.

Skidding, especially turning corners at high speed, destroys rubber and fabric.

Brakes out of adjustment make one tire wear too much.

Bad cuts in casings should be vulcanized.

Fill small cuts immediately with plastic filler.

Carry spare casings and plenty of extra tubes.

Tire changes are unavoidable, but roadside tire repairs are the mark of a novice.

more easily than a physiognomist can tell your own life's history from your face. "See here," says the tire man, laying his hand on one casing among the dozens on hangers along one wall of the branch's service department. "See this casing? Well, the man that brought this in swore that it had only 1,000 miles of service and that it was always pumped up to 85 pounds. Now, although we did not tell him so, we knew he was lying. Why, you can see for yourself! That tread has worn so that the outer edges are rounded; the outside has been on the road as much, nearly, as the middle of the tread. If the tire had been pumped up enough, that worn band would have been less than 2

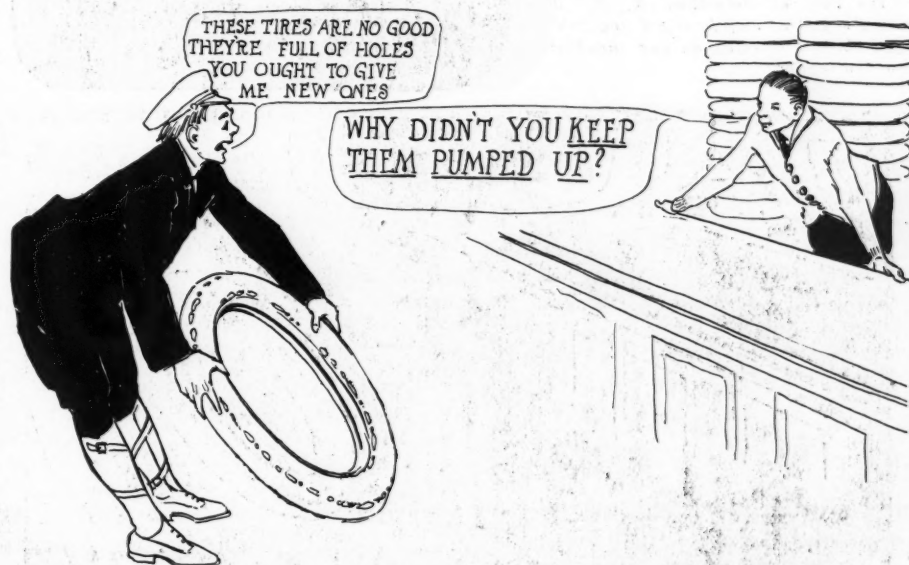
inches wide, and the outer edges of these knobs would have been sharp. He couldn't have worn the casing away that much in 1,000 miles, anyway, not even on stone roads.

"See this scoring all the way around where the rim strikes? Rim-cut tires too flat. This ditch on one side means that he has been running in the car tracks. Notice this little cut here on the tread? Now, then, I'll open it up so that you see the inside. The fabric is broken clear through, but you can't see much damage on the outside.

"That was nothing but a stone bruise that chipped a very small chunk out of the tread, but at the same time broke or weakened some of the fibers in the fabric. The owner paid no attention to it—kept on running, probably half-flat, till the constant flexion of the unprotected fabric caused the neighboring strands of the fabric to break, till finally it ripped clear across here with a bang, and the owner cursed us for selling him a bum tire. The wonder is that it did not blow out before.

"See how the tread has separated from the fabric? Water. All he needed to do was to clean out the cut with gasoline, fill it up with dough for a temporary repair, and put in a sleeve or boot till he could bring the casing to us. We would have vulcanized the tread and while doing so would have found the weak spot in the carcass and fixed that. Then it would have been as good as ever. As it is, he has lost a tire and we have possibly lost a customer."

There are many of these plastic compounds on the market for filling up small holes and cuts in the tread, and the most of them are good. They keep out the water and dirt, which, if allowed to enter, work in between tread and fabric and cause them to separate and eventually rot the cotton fabric. Such a repair lasts indefinitely, but it is usually considered better to have the cut vulcanized as a permanent repair.



Go and talk to a tire man about troubles and ninety-nine times out of a hundred his first words will be: "Keep them pumped up"

Uncle Sam Has Eight Truck Squads Operating in Mexico

Establishes Own Transportation System to Get Supplies to the Troops at the Front and Protect Line of Communication



Motor truck train No. 2 at Columbus, N. M., ready for trip to Pershing's troops in Mexico



Above, Packard boys awaiting their turn to go to the front. Right, Pancho Villa as he appeared just before the raid of Columbus, N. M. Below, a squad of Jeffery truck drivers just before starting on the dash across the border



By A. H. E. Beckett

EL PASO, Tex., April 1—Uncle Sam now has eight companies of trucks, each of twenty-seven units, now operating in Mexico to keep open the line of communication between the base at Columbus, N. M. The troops now in the field and a total of about 180 trucks are getting the most severe test ever given a motor vehicle in America.

When the troops of Gen. J. J. Pershing were first rushed across the border in the hunt for Pancho Villa, there were twenty-five big army trucks stationed along the border. Many of these trucks were necessary to the proper handling of the business of the quartermaster's department at the El Paso depot and could not be spared for service at the front.

The First Big Order

Every available truck in El Paso and Douglas was rented by the army officers. No purchases were made here because of a lack of authority. The first big purchase was made through New York when the White and Jeffery factories obtained orders for twenty-seven trucks each, the Whites being 1½ and 2-ton sizes, while the Jefferys are of the quad type, 2-ton capacity. Since that time another order for Jefferys has been placed and delivered and the army is also using a company of twenty-seven Packards, 1½-ton capacity.

The original equipment consisted of various makes, the Velie 3-tons predominating. There are also little Fords, Willys-Utilities and a few other trucks of light size now in service for the army.

The word road is hardly proper in speaking of the line of communication with the field case. It should be "trail" for the route lies over the rough desert of northern Mexico and the old trail has been so cut up by the passage of cavalry, trucks and motor cars that it now bears more resemblance to a sandpit than to a high-



way. But it is becoming a life-sized trail, at least, under the truck traffic.

The trucks sink to the hubs in the loose sand and it requires every bit of available power for them to struggle forward. Anything like speed is impossible and an average of 10 miles per hour is looked upon as fast by the army chauffeurs.

Going over the trail in the wake of a company of Jefferys one finds a perfectly smooth surface the width of the tread between the wheels while the sand is piled up in little ridges where the wheels have pulled through. The Jefferys are of the solid wheel type and these wheels offer less resistance to the sand than the artillery type, which have to lift a certain amount of sand with every revolution.

One of the trucks carried a machine gun and a squad of soldiers but, despite the thrilling stories now being sent out of El Paso by war correspondents who are no nearer the front than this city—and have no desire to be—there are no armored trucks in service. A real armored truck would be an utter impossibility over the trails, as the heavy load would be too much.

Scarcity of Gasoline

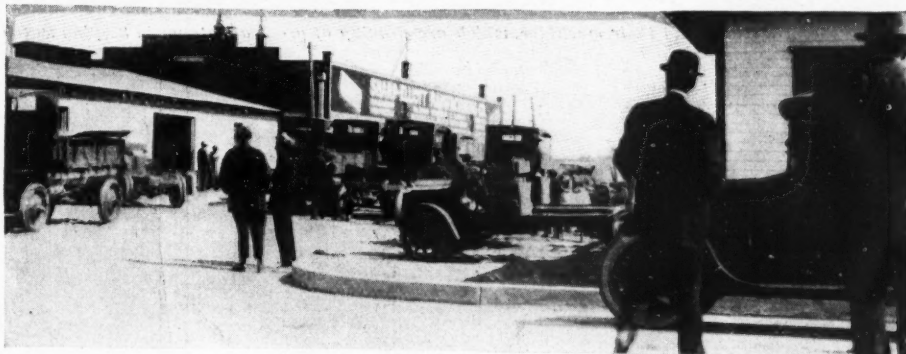
The 2-ton trucks carry an average load of about 1½ tons and the load of the smaller trucks is proportionately small. No truck yet has been able to carry a capacity load and give efficient service.

The big obstacle to the use of trucks is the scarcity of gasoline in northern Mexico. With the road conditions as they are, it requires almost 1,000 gallons to enable a full company of trucks to make the return trip between Columbus and the front.

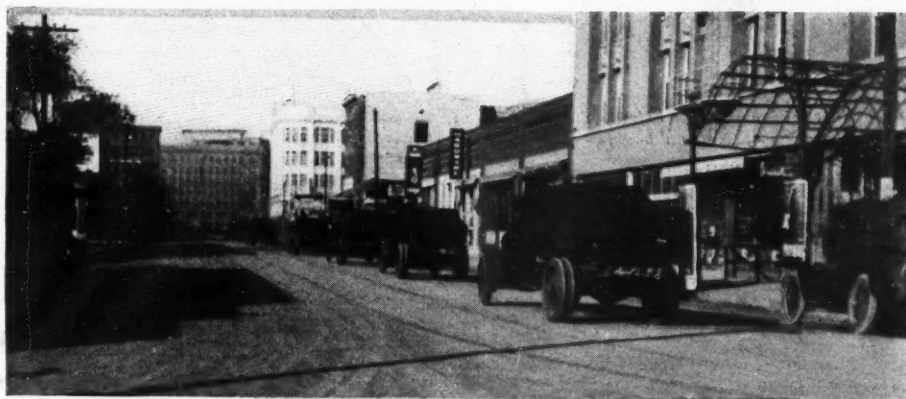
At the request of Gen. J. J. Pershing, the war department has ordered three big water trucks. These are of the type now used in the larger cities for street sprinkling, but the water will be used for the troops and not for settling the trails, where huge clouds of dust that can be seen for 25 miles float upon the passage of a company of trucks. These water trucks are equipped with extra wide wheels but it is doubtful if they will be able to carry any-



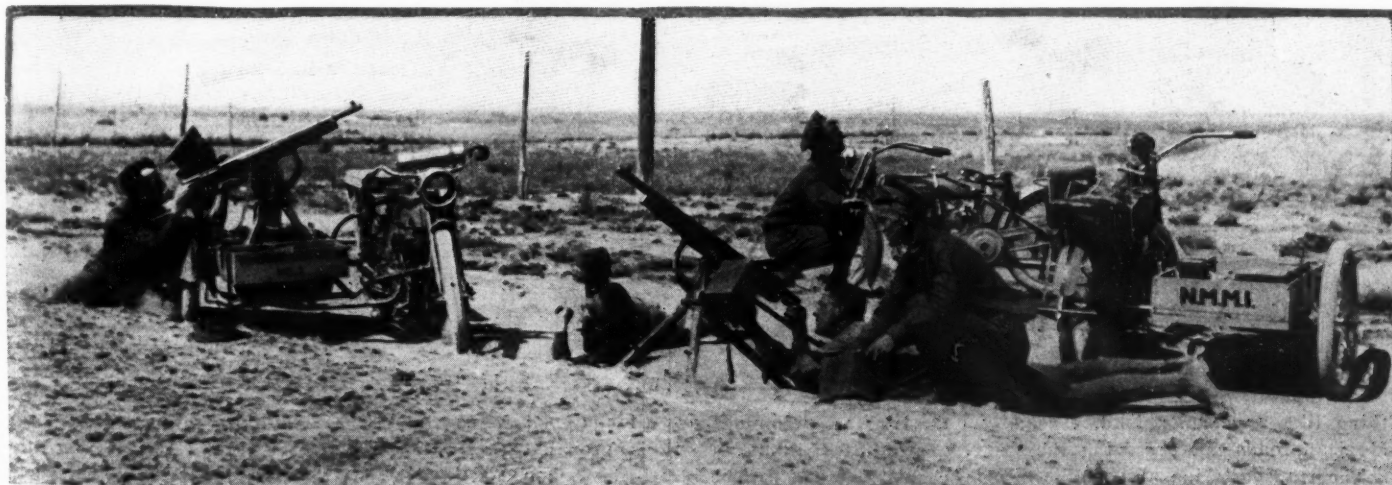
Some of the 27 Packards loaded with army supplies and lined up ready for the start



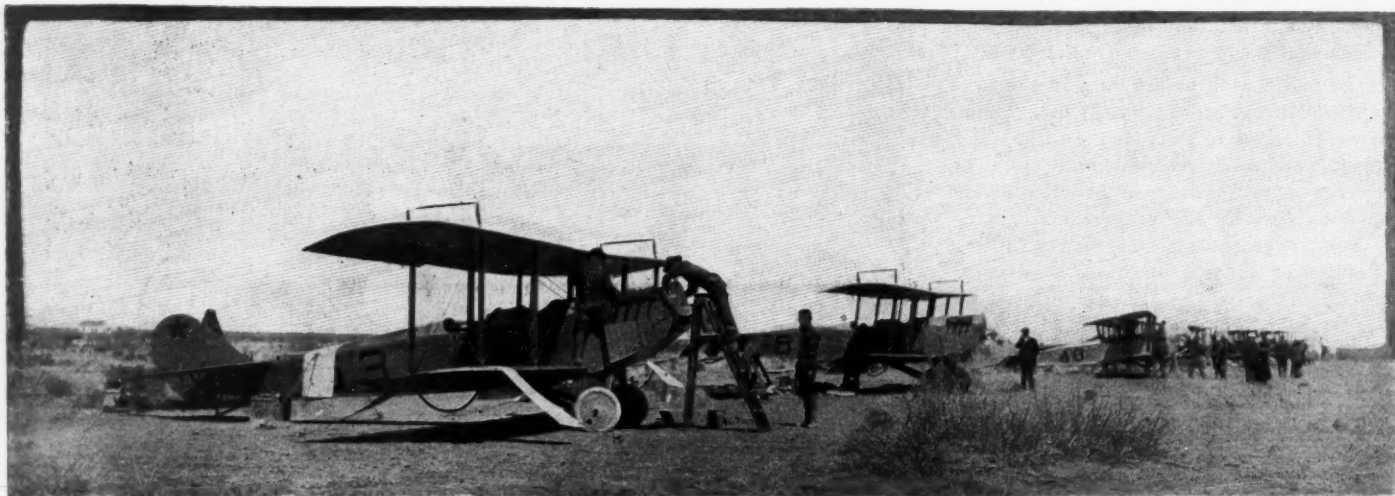
Groups of chassis impatiently awaiting their turn to be "fitted"



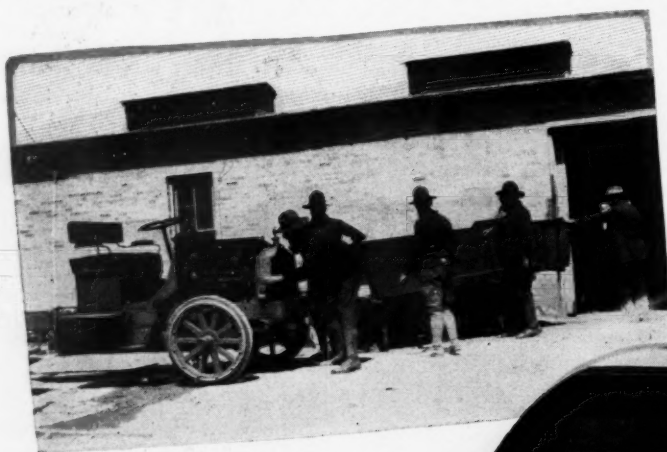
Off on the 90-mile run, over border roads, to Columbus, N. M. The Packards take the lead



Motorcycle machine gun squad. This weapon is considered to be one of the most effective the U. S. could use on enemy aircraft



Air scouts and their machines, which are proving of great assistance in keeping watch of the Villistas in mountainous sections



Above—Civilian drivers help rush the work of fitting on bodies

In circle—To distinguish cars readily, each driver has chalked his name and number on his mount in big letters. Others are "Tex," "Bunny," "Skipper," "Slim," etc.



Fitting body on Jeffery quad. One is fitted every 15 minutes



A load of bodies, taken from two-mule team army transports

thing like a capacity load, especially on Mexican roads not deserving the name.

The transportation of gasoline also is a problem that will take some solving. The

trucks now in use are all equipped with standard tanks but it is probable that extra tanks will be installed.

Army officers are now in El Paso buy-

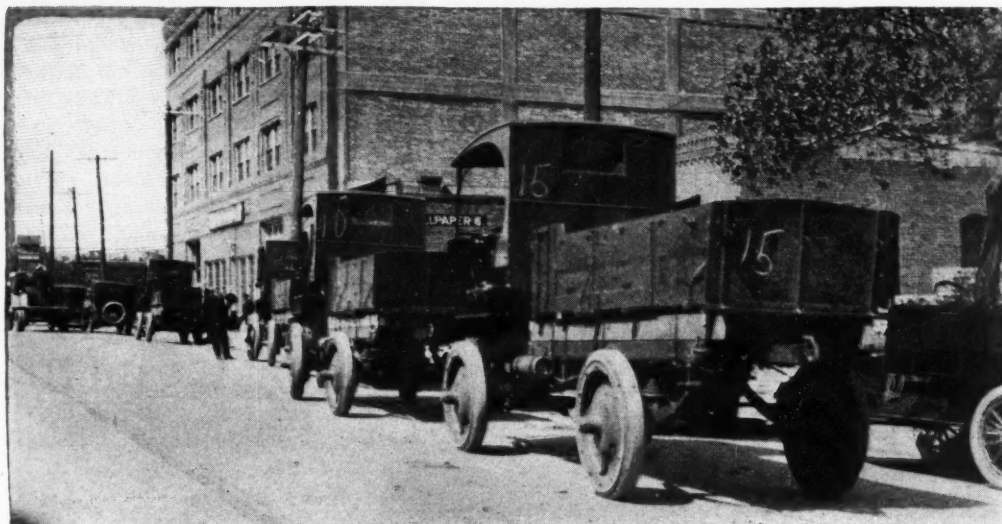
ing supplies for the opening of a machine shop and repair depot at Columbus, where there are already about twenty trucks and twice that number of touring cars already out of commission.

It is estimated that the order for supplies will total \$56,000. The requisition for Ford parts alone, placed with a local company last Saturday, totalled \$9,600. When the requisition reached the quartermaster's office from the base at Columbus, Major Elliott was heard to say something about having Henry Ford move his factories down here.

Mechanics in Demand

Competent mechanics also are in great demand while the local carpenters had to work overtime all last week equipping the trucks sent from the east with bodies. Through some mistake, no bodies were sent with some of the chassis and the army officers have had to temporarily mount wagon bodies, of the familiar Studebaker type, on the trucks.

One interesting bit of news leaked out a few days ago. The Western Motor Supply Co. of this city has booked an order for 1,000 Prest-o-lite tanks for the army. Whether these lights are to be used to assist the troops in night work along some of the canyons in Mexico or are for cars



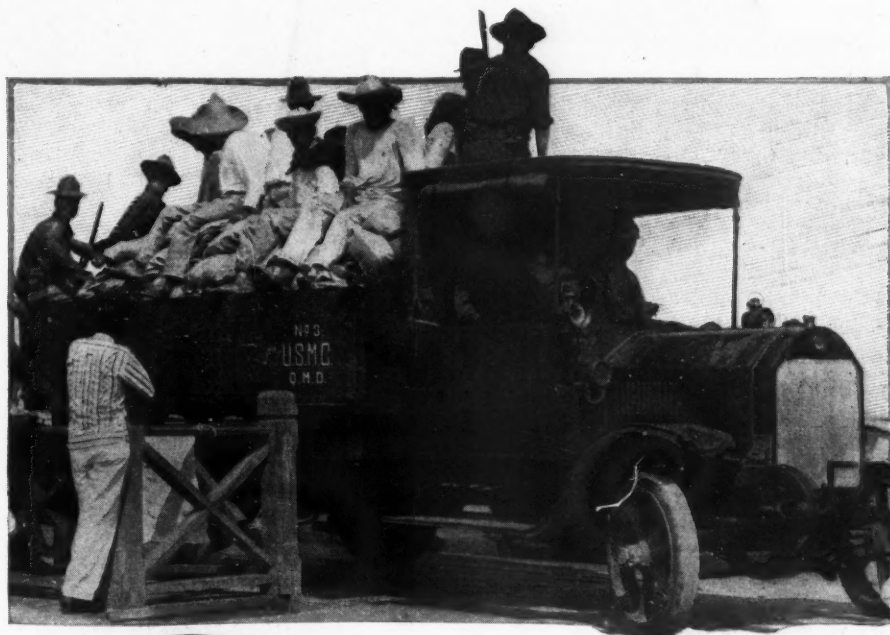
Jeffery quads with bodies just completed. Busy quartermaster's headquarters in background



Capt. Drake, of quartermaster's department, who started the cars



Truckmaster Carl W. Newell, of Packard, at right conferring with Truckmaster Mahoney, of Jeffery, just prior to start



Quartermaster's truck loaded with mail at Vera Cruz

is not known, but is generally believed here that the army plans to put up 1,000 light touring cars for the quick transport of troops if the railroads are not available. So far, the Fords are making the best showing of any touring cars. Gen. J. J. Pershing, the commanding officer, uses one for himself.

Over 100 Maxwell owners in El Paso have placed their cars at the disposal of the army authorities, but it is unlikely that any private cars will be taken, except in an emergency.

HOW U. S. DOES THINGS

El Paso, Texas, April 1—When American organization sets out to accomplish a task, it does so with efficiency and dispatch, in time of war as well of peace. We daily hear of unpreparedness, but American ingenuity and energy are on the job, and things are happening.

It was but a few days ago that government orders were received at the Packard



Truckmaster E. H. Mahoney, of the Jeffery squad

and Jeffery plants for a squad of trucks for Mexican service. Day before yesterday the chassis arrived here; this morning the entire 54, fitted with regulation United States army bodies, set out on their 90-

mile trip over border roads to headquarters at Columbus, N. M., fully equipped, each with a load of army supplies, and not so much as a single screw missing.

Hardly had the trucks been driven off the flat cars under their own power than a crew of carpenters went after them with hammer and saw, and the regulation army bodies were fitted at the rate of one every 15 minutes. These bodies, which were taken from two-mule team army transports, are equipped with sideboards and easily accommodate the 2-ton capacity of the trucks, in compact army supplies.

The civilian drivers, recruited in Detroit, Mich., and Kenosha, Wis., fitted out in regulation army uniform, were eager to get under way, and made a decidedly business-like impression as they lined up for inspection before the start. Each man is equipped with a big forty-five army auto-

matic, cartridge belt, canteen, sweater jacket, knickers, canvas puttees; substantial, tan army shoes, Khaki shirt and the regulation United States sombrero. Truckmaster Carl W. Newell has been connected with the Packard service in Mexico for 6½ years and is thoroughly familiar with the territory in which his charge of twenty-seven trucks will operate. Truckmaster E. H. Mahoney, of the Jeffery contingent, is confident of the success of his cars in

the desert country, as the squad which preceded him has already demonstrated the efficiency of the four-wheel drive on difficult roads.

FUNSTON CALLS FOR MORE TRUCKS

Washington, D. C., April 1—General Funston sent a hurry call to the war department for two additional motor trains. This is due to the extension of the line of communication on a distance of over 200

miles below the border. The Fifth Cavalry has been sent into Mexico to protect the lines of communication. It is stated that General Funston's request was based upon the excellent work being done by the trucks in Mexico at the present time and that he asked for Jeffery trucks, their four-wheel drive adapting them to the road conditions, which are bad and getting worse. It is stated equipment for these two companies has been purchased.

Armored Motor Truck for New York National Guard

Will Carry Two Machine Guns—Resists Rapid Firing Gun at 50 Yards



The heaviest type of the armored cars built for experimental use by state militia troops

NEW YORK, April 3—Adequate defense demands adequate methods and equipment. To meet modern military conditions, modern means are essential. Six patriotic citizens have taken steps to see that such means are placed at the disposal of the National Guard of New York. Their contribution is in funds amounting to \$100,000 for the construction and equipment of an armored motor battery to be constructed along lines laid down by experiments conducted under their supervision.

Profit by Europe's Example

Europe's example has shown that the most important part of an engagement is the start. The first five moves of a well-played checker game win it or lose it. Of prime importance at the start of action is the ability of one force to deliver effective fire where it is most needed and to retreat rapidly. Modern types of rapid-fire guns have been found capable of very effective execution, but seriously hampered unless efficient means of transportation and protection to their crews are given.

The armored motor vehicle has been proven the most satisfactory mount for these guns. In Europe, a number of different types of these vehicles have been in use, some of which were so light that they could not withstand the rigors of service and others so heavy that they found difficulty in negotiating bad roads. Somewhere between these extremes lies the most satisfactory type for American conditions.

Capt. H. G. Montgomery, one of the donors of the fund, has been charged with the task of determining this and has enlisted the services of the engineering staff of the International Motor Co., New York, in constructing four experimental models. These are a Mack 2-ton, worm-driven truck chassis, a White 1½-ton truck chassis, a 2-ton Jeffery chassis and a Locomobile six-cylinder touring car chassis. A Jeffery 2-ton, four-wheel-drive chassis has been equipped with a steel service body.

The International Motor Co. has just finished the construction of the Mack armored truck. This is the heaviest of the three experimental types and is fully armored. The chassis is the AB model of 2 tons capacity, and with the body and equipment, weighs 9,052 pounds. Practically identical bodies will be used on the other chassis.

It is designed to carry two rapid-fire guns, ammunition and a crew of gunners. The armor is made of a special heat-treated steel and resists regulation U. S. army rifle or machine gun fire at 50 yards. It completely houses every portion of the chassis and most all above wheels.

It consists of four sections: the hood, the cab and two body sections, each of which has its own angle-iron frame. Each unit is capable of being demounted separately, and with the two rear sections removed, a platform truck for the transportation of supplies is formed. It stands 100 inches high overall, the armored sides extending down to within 1½ feet of the

ground and up to a height of 6½ feet. The floor is about 2¾ feet above the ground and the sides extend 3¾ feet above the floor, so that in a sitting, kneeling or crouching position, the men are entirely protected.

The armament consists of two rapid-fire guns, mounted on fixed tripods, fitted with barbettes or shields which extend above the armored sides. One of these is located in the front section of the body and on the right side, and the other at the rear and to the left. For rifle fire, seven loopholes or ports, provided with sliding shutters, are provided, one at the rear, two on side of the cab. The wheels are of wood, with steel disk armor, the rear wheels being half covered by the armored sides.

Motor in Front

The motor occupies the front portion of the vehicle, as usual, the radiator in front being protected by a curved steel box. This box has a large air opening at the bottom, below the bottom of the radiator, above which is a sheet of armor which effectually prevents bullets reaching the radiator, either directly or by deflection, regardless of the direction from which they come. The motor hood is hinged at the dash and may be raised entirely, or the two sides, hinged at the eaves may be raised independently. The armor belt extends down below the crankcase, so that bullets intended for the crankcase will be stopped.

So that the driver's cab may be below the range of the guns, the driver's seat is

very low, as in racing cars, and protected by a deep cowl. This cab is 4 feet 4 inches long and 4 feet 7 inches high. The driver sits at the left. The cowl is fitted with two ventilation doors at the top, the right one of which carries a Gray & Davis 10-inch searchlight on its bottom, so that when the door is opened, it extends upward. On the roof of the cab is a hatch, hinged at the front, which provides ventilation, and may serve as an additional shield to the rear portion. At the front of the cab is a shutter hinged at the top and extending the full width, which is adjustable to provide a wide or narrow vision for the driver. Two rear-view mirrors are placed in front of each cab port-hole to give the driver a view behind.

A new device to provide rear-end drive has been developed and will be applied to all of the vehicles. This consists of a dummy steering wheel and an electric signal at the rear, by which an indicator on top of the front steering wheel will be turned, permitting the rear steersman to direct the actual steering by the driver when running backward. This is considered superior to the dual-steering means which has been used in Belgium and experimented with in this country, owing to the concentration of the actual driving at one point and to the elimination of the lost motion which seemed inseparable from the other construction.

No Roof on Body

No roof is provided on the body, and there is only one door. This door is at the rear, and is placed high, access being had by a step. The rear wheels are provided clearance under the low floor by steel wheel houses. All doors, hatches, etc., are provided with either refrigerator type latches or wheel-nut hold-downs.

Electric lighting and starting is provided, so that the motor may be stopped and started while under fire without exposing any of the men to fire. Besides the disappearing searchlight, there are two headlights and two tail-lights. Both of these are placed very low, so as to concentrate the light on the ground and prevent its carrying any great distance.

The storage battery used for lighting and starting is separated from the ignition, the latter being supplied by a Bosch magneto and a dry battery. There is an electric dashlight under the cowl to light the instruments and a socket for an extension light. Two fire department kerosene lanterns and two Pyrene fire extinguishers are mounted inside the body. A tool box is placed to the left of the driver's seat.

The radiator is of specially large size to insure cooling under difficult operating conditions and to compensate for the somewhat restricted air circulation. The fuel tank is located below the floor, completely protected by the armor and feeding by the Stewart vacuum system.

For towing purposes, a special spring-cushioned drawbar is provided at the rear,

anchored to the rear frame cross-member and extending in a ring back of the rear armor plate.

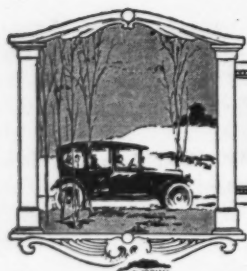
The work of developing these vehicles is under the personal supervision of Captain Montgomery, who has turned the designing and construction over to the International Motor Co. This company, under the direction of E. R. Hewitt, consulting engineer, Albert F. Masury, chief engineer, and

H. F. Welch, has built this first design after careful consideration of existing types in use abroad and of experience in building large numbers of chassis for the Allies. Armor plating has been made by the Carnegie Steel Co. Complete specifications and blueprints of every portion of the vehicle have been prepared, there being about 100 working drawings for the superstructure alone.

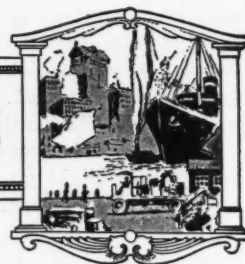
Scouts of the Twentieth Century



Overland cars fitted with machine guns for crossing the border, with a scouting party in advance of troops



EDITORIAL PERSPECTIVES



Engineers Into Rules

IT IS a commendable sign when engineers take a sufficient interest in tests to formulate rules governing such. Last week's action of a committee of the Society of Automobile Engineers in drafting rules for fuel economy tests is a step in the right direction. Heretofore engineers have not taken sufficient interest in tests of various natures. The engineer invariably sees a test from some other angle than the layman. The layman sees the practical end, the engineer looks for scientific ramifications. Safety is in bringing these extremes together. Perhaps the rules as drafted by the engineers will be too strict, too severe. They may appeal to engineers, but will be too technical for popular interpretation. If fuel economy tests are to appeal to the public the findings or results must be translated into every-day language. The results must be understood by the layman, by the car owner.

WE HAVE had a little too much of the opposite extreme; that is, tests that have not been technical enough, and tests designed primarily to appeal almost entirely to the owner. These tests have not been quite practical enough. They have shown how far a certain car fitted with a certain carbureter can go on a gallon of a certain fuel. Unfortunately in some the speed has not been a practical touring speed, and the route has not been over average touring roads. The tests have not

included an acceleration test. It is not difficult to drive a car 25 or perhaps 27 miles on one gallon of fuel, but it might be impossible to drive that same car with the same carbureter and the same fuel 150 miles over average roads at 17 miles to the gallon. Fuel economy tests should approach the conditions of practical touring as much as possible.

THE NEW RULES proposed by the engineers are for speedways. The engineers think it will be possible to get correct comparisons between tests made in New York, Chicago, Indianapolis, Minneapolis, Omaha, Sioux City, Des Moines and other cities. This is quite true, but it is also true that the figure of car efficiency on the speedway will be much higher than on ordinary roads. It should be possible to make tests on approximately level macadam road surfaces in different sections of the country and have road conditions as near uniform as on speedways in different cities. It is more important to the car owner to know of fuel economy on a level macadam road in Minnesota than on a banked board speedway in Chicago or New York. It is possible to get macadam roads that are nearly as uniform for tests as our speedways. The test on the level macadam road would appeal much more to the layman than the speedway test. Tests on uniform dirt, clay, stone, brick and macadam roads would provide very valuable data.

Spring Safety

YOUR car may have been in the garage for several weeks, perhaps a month or so. If you did not take the battery out when you stored the car that battery today stands in need of attention. It will undoubtedly require filling with liquid, distilled water, and perhaps the battery man may have a special liquid. If you have not filled the cells already, do so at the first available moment. Do not wait until a convenient moment, make it a part of your work to get the liquid put in. If your battery has been badly discharged it will be best to take it to the battery depot and have it well recharged. If your tires are deflated you cannot run without inflating them. You see with your own eyes the damage of running along the street on a flat tire. With a battery, the evil is there, but you cannot see it. It does not appeal to the eye. Give the battery a little of your tire sense.

IF you have not looked over the steering connections on your car for two, three or perhaps four years, there is no better time than right now to do so. At the opening of the season is a good time to inspect all steering connections. Your car perhaps has been running 3 or 4 years and never once have these connections been overhauled. You owe it to the personal safety of your friends and yourself to have this done. You may not require a single new part, not a new bearing, not a new bushing, or even a new cotter pin. For safety sake, look over all of the parts. See that the front wheels line up properly. It will save a good deal in tire mileage. There may be a bearing that needs attention.

NOW is a good time to clean the old oil out of the crankcase, wash the case out with kerosene and add fresh, new oil.

This should be done periodically. Some car owners do it every 1,500 miles. If you are not in that class then get in the class that does it once a year. Spring is the time to do it. Better to do it now than in the middle of July.

IF you have not had the demountable rims off your car all winter it will be a good investment to have them all taken off some fine day in April before you start on your regular country week-end trips. The rims get rusty. The tires often rust into the clincher. The quick-detachable bands get sprung. If you have to change a tire on a rim on the road it is hard work when the parts have rusted. It will give you a little more joy on your trip if you have all of this done. Then you know the tire is not rusted into the clincher lip, you know that the Q-D band is alright, in short, you have peace of mind, which is always a big asset in any tour.

IT is well to look over your supply of inner tubes, and replace some, if necessary. See that you are not carrying some old one that has not been repaired. We get careless in the late fall, and fail to get all of the tubes repaired. Take time by the forelock and do not get caught on the roadside without an extra inner tube. A little forethought on your part before beginning your spring touring or any use of your car will repay you before you are well into the summer. Be a general. Don't lose sight of the fact that the omnipresent word, "preparedness," is a good one, even though it does seem to be worked to death. Prepare against the little discomforts before they become big ones and you will get the most out of your motoring. This policy pays in the long run every time.

WARNING

Motor Age desires to warn its readers against a solicitor signing himself as "Frank Knight," "C. E. Sparks," and "C. F. Niles," who is reported as having fraudulently secured a number of subscriptions in Oklahoma and Kansas. Motor Age employs no such solicitor and his operations are without any authority from Motor Age.

DETROIT, Mich., March 24—One of the principal reasons why there are so many traffic violations is because the majority of motor car drivers do not seem to think that they are under moral obligation towards pedestrians is the opinion of George A. Walters, secretary of the Detroit police department.

"A majority of the drivers are well-intentioned, well-meaning," says Mr. Walters, "but they believe that it is rather up to the pedestrian to look out for his safety in the streets rather than for the motor car or any other vehicle driver to look out for the man in the street. It is this attitude of drivers which causes the majority of accidents and causes them to disregard the regulations concerning traffic.

"Education of all drivers along the moral side of the traffic problem is imperative," says Secretary Walters, "and it will be only when the man who drives a car or any other vehicle realizes that he is morally responsible that the traffic problem will become less difficult to handle."

Reports from traffic officers and patrolmen show that fully 95 per cent of traffic violations are caused by motor car drivers and a large percentage of these by either owners or drivers of the well-to-do class, or, in other words, by men of such a standing, of such education, that they can hardly be excused for breaking the laws, whereas the truck drivers and horse-drawn vehicle drivers reported as violators of the regulations are mostly uneducated men who do not realize that they are doing something wrong, something against the law.

Cars Bulk of Reports

Of twenty-one reports received in 1 day from the traffic department, all but one referred to motor cars, the other one to a horse-drawn vehicle. In eight out of ten cases, speeding was the cause of the driver being reported. In one instance, a car was being driven at 35 miles per hour, and the driver gave as an excuse that he wanted to catch an outgoing interurban car. Another driver, going at 34 miles an hour, said he was in a hurry to get downtown. A driver going at the rate of 32 miles an hour gave as an excuse that he would lose his job if he came late at the office. The driver of a delivery car going at the rate of 32 miles an hour gave as his excuse that he had to hurry to deliver some goods, otherwise they would not be accepted. Two reports show that drivers who were going at 30 miles an hour said they were in a particular hurry to get home. Another delivery car driver was stopped because he was driving at the rate of 27 miles an hour, while another one was reported for his reckless driving at a street crossing through a crowd of people getting off a street car. There were one or two reports concerning undue emissions of smoke and absence of lights.

The offense of the horse driver was that

Classifying Speeders

Secretary of Detroit Police Tells Who Hits It Up Most

Owners of High-Priced Cars Are Found to Be Worst Offenders

he had failed to stop when signaled to do so. There were also complaints about drivers having parked their cars near a fire hydrant.

From the records, it was shown that most of the offenders were residents of the best residential sections of the city, several being owners of high-priced cars, which fact, says Secretary Walters, is also to be taken into account.

STEAL CAR DURING PRESENTATION

Probably one of the boldest motor car thefts that ever was committed in Texas took place at Temple, Tex., recently. Local citizens had purchased a roadster which was to be presented to Miss Kate Henley, demonstrator for girls' canning clubs in Bell county, in recognition of her valuable services. The arrangements for the presentation event duly were made and the car was driven to the front of the morning newspaper office where it was to remain while the ceremony of turning the gift over to Miss Henley was carried out. The presentation speech was made and an appropriate reply given by Miss Henley whereupon she was led to where the car was supposed to be. It was missing! Although surrounded by a crowd of people who were gathered to witness the presentation ceremony, and under the glare of electric lights, thieves had driven the car away. Officers belonging to the sheriff's office and the police force got busy and a

posse of them was on the trail of the thieves within a few minutes. The stolen car was followed and the two men who are alleged to have taken it were captured near Austin. The car was brought back and turned over to Miss Henley.

BANANA GROWERS NEED TRUCKS

New York, April 1—In a recent communication from the consular department of the island of Jamaica, the Electric Vehicle Association of America has been informed that never has the time been so opportune in that district for the introduction of battery-propelled vehicles. The roads in Jamaica, it is stated, are excellent and while there are a few possible exceptions, the hills average a grade of only 1.2.

Agriculture is the most important industry of the island. There are immense banana and coffee plantations, their produce, together with cocoa and cocoanuts, being the principal exports. Many large industrial plants are engaged in the manufacture of aerated waters, cigars and cigarettes, biscuits, shoes and leather.

The cultivation of bananas is the principle industry, Jamaica exporting twice as many bananas as any other country in the world. It is in this particular field that the electric vehicle seems well adapted, the association is informed. The actual work of transporting bananas from the plantations to the railroad tracks for final shipment is something of a problem. On the largest plantations it is customary to build railroads or tramways through the plantations, a very expensive system to operate. Many of the smaller plantations depend on bullock carts. Obviously this means a great loss, due to inefficiency, which the motor truck should be able to overcome.

Electricity for charging is cheap and should become even cheaper as more power supply stations are developed.



See America First

See America Now

EDITOR'S NOTE—This is the seventy-third of a series of illustrations and thumb nail sketches of the scenic and historic wonders of America to be published in Motor Age for the purpose of calling the attention of motorists to the points of interest in their own country.

NO. 73—EAGLES' NEST, THE SHADES, IND.

DOWN in the Hoosier State there is much to be seen that belong in the scenic state. Tourists ever find Indiana overflowing with those things that make for the greater delights in touring by motor. At the left is shown an interesting bit of scenery known as the Eagles' Nest. It has the appearance of being in a place where none but an eagle might reach it, but such is not the case. It is close to the roadway, not far from The Shades, Ind.

Motor Car Makers Unite in the Manufacturing of Gasoline

National Automobile Chamber of Commerce Aids in Organizing a Company to Produce and Refine Petroleum

NEW YORK, April 3—The most important result of the increasing agitation against excessive gasoline prices is the organization of motor car manufacturers into a company for the production of gasoline and also to supply complete cost information on gasoline production with a view to protecting the makers and users of motor cars, motor trucks and other users of the fuel. This company, which will be formally incorporated within the next few days, with a capitalization of \$5,000,000 to \$10,000,000, will distribute its stock throughout the whole country in such a way that it cannot possibly pass into the control of any competitive interest.

The new company will prospect, produce, act as jobber in crude oil, build refineries and develop a large selling organization. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, Inc., who is in close touch with the promoters, states that they have received numerous offers of oil lands, refineries, equipment, etc. Besides Mr. Reeves, S. A. Miles, manager of the New York and Chicago motor car shows, and John A. Royall, for 25 years identified with the gasoline industry, are the only persons actively interested in the plan whose names have been permitted to be used in connection with it.

Origin of Plan

Before any active steps were taken, exhaustive reports of the conditions surrounding the oil business were quietly prepared, with the result that the manufacturers evinced their willingness to test the theories advanced by the oil companies concerning the reasons for the high prices now prevailing and the further advances so frequently threatened. It was during the lengthy conference held during the past few days between representative car manufacturers, officers of the N. A. C. C. and men of experience in the oil industry that the plan to form an organization which would produce results in the way of reducing the price of gasoline to the motor car and motor truck user was decided upon.

The purpose of the new company will be to produce gasoline, kerosene, lubricating oil and other products of petroleum, not necessarily for the purpose of injuring any business at present in operation, but to demonstrate that gasoline can be profitably produced and sold at a price lower than that now prevailing.

"This," said Mr. Royall, "we regard as the only real remedy for existing conditions. We shall, at the very least, demonstrate that no further increase is necessary and so protect the business of the motor car makers and their hundreds of millions of invested capital.

"It is highly desirable to discuss, in connection with the bills introduced in Congress, methods of competition and to find a remedy for existing and future conditions of the oil business, whereby the consumer is to be forever safeguarded against unfair methods.

"This corporation, when finally launched, will include all interests outside of the oil interests, and in this latter designation, I include the so-called 'competitive oil interests' from which no relief can be expected. They are all founded upon the same selfish interest, and maintain prices rather than provide real competition to the business.

"This company," continued Mr. Royall, "will have upon its board of directors a large representation of the motor car and other allied industries, which despite their hundreds of millions of invested capital are now wholly without representation in business so vital to its present and future welfare. In addition to its board and managing directors, it has been suggested

that the company have an advisory board of at least 250 non-resident advisors, elected pro rata according to the population of the various States, who will act without compensation."

Mr. Miles, who has been in consultation with manufacturers and others, stated that in connecting himself with the new company he felt assured of their hearty co-operation. Declaring that the new company will really attempt to provide life insurance for the builders of cars.

They are not interested in the new company primarily for the profit of the oil business, though we do not pretend to say that the company will be conducted without reasonable profit if it is obtainable."

DR. RITTMAN WITH NEW COMPANY

Pittsburg, April 1—Dr. Walter F. Rittman, chemical engineer of the Bureau of Mines, and inventor of the new process for obtaining a much greater yield of gasoline from crude oil, has resigned his

THE MOVE FOR CHEAPER GASOLINE

[Copyright: 1916: By John T. McCutcheon.]



Cartoonist McCutcheon's idea of the reason for federal action on the fuel situation, as printed in the Chicago Daily Tribune

position with the bureau to become head of a company being organized for the purpose of manufacturing gasoline. The new concern will be located here.

CHALMERS PRICES GO UP

Detroit, Mich., April 4—The Chalmers Motor Co., on April 15, will increase the prices of the three models built on the new six-thirty chassis. The touring car and cabriolet will each be increased \$40, making the former \$1,090 and the latter \$1,440. The price of the roadster will be raised \$20, to \$1,070. All of these figures being f. o. b. Detroit. The increase in cost of practically everything that goes into the makeup of the cars is responsible for the raise in prices.

DETROIT ELECTRICS COST MORE

Detroit, Mich., April 3—The Anderson Electric Car Co., which makes the Detroit electrics, is the first among the electric vehicle manufacturers to announce an increase in price of its cars, due to high cost of materials. This increase will be \$100 for each of the five models made by the company and will go into effect April 8.

PATHFINDER ANNOUNCES INCREASE

Indianapolis, Ind., April 3—The Pathfinder Co. has found it necessary to increase the price of two of its models to offset the higher cost of raw materials now prevailing. After April 15, the Pathfinder touring car will sell for \$2,750 and the Cloverleaf roadster for \$2,900. Both have sold heretofore for \$2,475. Pathfinder agents are permitted to receive orders and enter contracts at the present figure until the date of the increase.

TRACTORS COST MORE

Omaha, Neb., April 5—Scarcity and higher cost of raw materials due to the great demand for metals of all kinds for munitions manufacture, has resulted in an increase in the prices of many lines of farm tractors.

The Avery Co. of Omaha has announced the following increases in its various types of tractors: 5 to 10 horsepower, \$295 to \$365; 12 to 24 horsepower, \$1,125 to \$1,195; 18 to 36 horsepower, \$1,680 to \$1,775; 25 to 50 horsepower, \$2,145 to \$2,190; 40 to 80 horsepower, \$2,475 to \$2,625.

An increase of approximately 5 per cent has been placed in effect upon all farm tractors by the Emerson-Brantingham Implement Co.

RAISE PRICE OF STARTER

Newark, N. J., April 1—An increase in price for the Splitdorf-Apeleo electric starting and lighting system for Ford cars has been put into effect by the manufacturers of the outfit, the Splitdorf Electrical Co., the new price of \$75 being an increase of \$10 over the hitherto standard retail cost.

New Time-Sales Plan Eastern Financial House Will Accept Dealers' Credits on Many Makes of Cars

National Campaign to Inform Public of Instalment Privileges

DETROIT, Mich., April 1—A new plan for financing time sales of motor cars, which will not be restricted to any one particular make, has been announced by the Guaranty Securities Corp., New York City, a firm which is an outgrowth of the Guaranty Securities Co., Toledo, O., that was originally formed to finance time sales of Overland cars.

The plan as worked out by the new Guaranty Securities Corp. is simple. It consists in selling a man a car on a cash payment of from one-half to one-third the list price of the car and the balance in eight equal monthly payments, or fewer installments, if desired. To this is added in cash 2½ per cent of the list price to pay for necessary insurance and incidental expenses if the car lists at \$600 or more; or 3 per cent if the selling price is under \$600. The insurance is for full 80 per cent fire and theft coverage for 1 year.

At the present time the Guaranty plan has been extended so that the following cars may be sold by the dealer under its provisions: Ford, Hudson, Studebaker, Paige, Chevrolet, Reo, Oakland, Overland, Buick, Chandler, Maxwell, Kissel, Oldsmobile, Willys-Knight, Cadillac, Chalmers, Dodge, Jeffery, Hupmobile, Mitchell, and Franklin. The credit concern intends to inaugurate a national campaign to inform the general public of the plan, which will probably be widened in its scope as time goes on.

The dealer pays no interest or premium, but when the customer has signed a contract in accordance with instructions given by the Guaranty concern, the dealer endorses it and sends it on to the credit house. The dealer keeps all the cash, including the amount collected for insur-

ance and incidental expenses. In addition to this the Guaranty Securities Corp. sends to the dealer immediately the amount of the deferred payments due from the customer, except the insurance and incidental collections and 20 per cent of the deferred payments. For this amount a deferred certificate is issued to the dealer, in which the Guaranty Securities concern agrees to pay the remaining 20 per cent as soon as the customer finishes paying for the car.

To show how this work out, the table at the bottom of this page is given.

TIRE FIRMS WIN VERDICT

Cleveland, O., April 1—A jury in the federal district court yesterday returned a verdict for the defendants in the case of the Automobile Co-Operative Association of America against the B. F. Goodrich Co., Akron, O.; the B. F. Goodrich Co. of New York; the Diamond Rubber Co., Akron, and the Republic Rubber Co., Youngstown, O. The original petition included the Firestone Tire & Rubber Co. and the United States Rubber Co., but they were dismissed before the trial began.

In each case the petition was directed against the officers of the companies personally, as well as the companies themselves.

Defendants were charged in the petition with having formed and operated a combination in restraint of interstate and foreign trade and plaintiff claims that through this alleged combination its own business was destroyed and it lost the \$75,000 capital with which it began business.

These companies, it was alleged, sold tires and other rubber goods and allowed a discount, usually from the retail price, which went as a profit to the dealer, but shortly after the plaintiff began business, it was charged, this combination was formed and prices were fixed arbitrarily, thus excluding the plaintiff and others from buying and selling freely and obtaining motor car accessories.

Price of car	Cash payment required	Amount payable on deferred payments
\$ 750 or less.....	33 1/3 percent of list	66 2/3 percent of list
\$ 751 to \$1,200.....	40 percent of list	60 percent of list
\$1,251 to \$1,500.....	45 percent of list	55 percent of list
\$1,501 or more.....	50 percent of list	50 percent of list
Dealer sells a car listing at.....		\$1,000.00
Dealer adds for insurance and incidental charges (2 1/2 percent of list over \$600).....		25.00
Customer pays down on car (40 percent).....		\$ 400.00
Customer pays down for insurance, etc.....		25.00
Customer gives contract note for deferred payments \$75 per month for 8 months.....		600.00
Totals.....		\$1,025.00
Guaranty Securities Corp. buys contract note at face value.....		\$ 600.00
Guaranty Securities Corp. holds cash on deferred certificate till payments on contract note are completed (20 percent).....		120.00
Guaranty Securities Corp. deducts cash received for insurance, etc., and retained by dealer.....		\$ 480.00
Guaranty Securities Corp. pays dealer cash immediately.....		\$ 25.00
Customer pays dealer cash on delivery (as above).....		\$ 455.00
Dealer receives immediately in cash.....		\$ 425.00
Guaranty Securities Corp. redeems deferred certificate in cash when payments on contract note are completed.....		\$ 880.00
Dealer receives full list price.....		\$ 120.00
		\$1,000.00

Average Motor Car Engine Wastes Much of Its Fuel

Hoosiers Are Told That Something Must Be Done to Decrease Heat Loss—Varying Cut-Off Advised

INDIANAPOLIS, Ind., March 31—An unusual means of increasing the efficiency of motor car engines by the use of increased compression aroused lively discussion at the meeting of the Hoosier section of the Society of Automobile Engineers at the Claypool hotel this evening. This discussion was the result of the statements made by C. E. Sargent, chief engineer Lyons-Atlas Co., in the paper of the evening, "Increasing the Thermal Efficiency of Automobile Engines." Mr. Sargent, who has had long experience with the Deisel type of engine and with gas engines of large sizes, is particularly fitted to discuss the advantages and disadvantages of higher compressions that are used in motor car engines, because it is by the use of extraordinarily great compression pressure that the Diesel engine has been successful.

In his paper, Mr. Sargent's remarks were based upon the fact that the thermal efficiency of the average good internal combustion engine has been never much greater than 20 per cent.

This means that only one-fifth of the actual power possibilities in the fuel has been turned into useful work in this type of engine. His remarks were directed toward the development of engine design which would decrease some of the 80 per cent heat loss in friction, cooling water radiation, and exhaust. He offered for consideration the idea of varying the cut-off rather than the throttle to produce changes in engine speed and power. By this is meant changing the time at which the inlet valve closes, instead of changing the amount of opening of the throttle. His paper follows:

which, returning to the cylinder by gravity, converted more heat units into work than has any engine with a restricted piston.

While the ratio of the explosion chamber surface to the volume it contains is one efficiency factor, and the requirements of a minimum quotient the rational reason for valves in the head, the advantages of multi-cylinder engines with their high speed, light reciprocating parts and minimum angular velocity variation seem to offset any thermal losses due to increased surface per unit of volume, a characteristic indigenous to this type.

Even with a spherical explosion chamber, the ratio of the surface to the heat within decreases with compression, therefore the higher the compression the less cooling surface per unit of heat is exposed. The limitation of high compression is, of course, premature ignitions, a condition incompatible with successful operation.

The possibilities of increasing the thermal efficiency of automobile engines by decreasing the jacket losses lies then in a high piston speed, a minimum surface per unit of volume characteristic of the sleeve valve and the valve-in-the-head types, and as high a compression as possible without the possibility of spontaneous ignition.

Exhaust Losses

While small gains in efficiency have been made by reducing the mechanical friction and decreasing the losses to the water-jacket, the loss of heat to the exhaust has had but little consideration.

Several compound engines of the internal combustion type have had a mushroom existence, but when one considers the added surface of a larger cylinder and the time in which the pressure after ignition drops to less than the pressure of compression, we see the improbability of reducing the losses by this means.

The ordinary engine is more efficient at full load than at partial load, but unfortunately the automobile engine operates at partial load most of the time, therefore, if we would increase the B. H. P. per unit of fuel or the miles per gallon, it should be so designed that its thermal efficiency is greatest with average or partial loads, or at least is no less than with full load.

In order to comprehend thoroughly our problem let Fig. 2 represent an indicator diagram of an internal combustion engine developing its full power, in which AB represents the piston stroke and atmospheric line; C the highest compression; CD the firing line; DE the expansion line and E the exhaust opening.

A cylinder full of mixture (AB) is compressed to C and ignited, raising the pressure to D, and as the piston moves down the pressure drops to E, where the exhaust opens.

It is necessary to open the exhaust valve from 40 degrees to 60 degrees before the end of the working stroke in order to get rid of the back pressure on piston during the exhaust stroke. The release of this pressure, thirty to forty pounds absolute, with its accompanying "bark," visible flame and red-hot exhaust manifold, is ample evidence of thermal inefficiency, even without the proof deduced by a diagram analysis, or heat balance.

If, instead of releasing a less volume of hot gas than the volume of cold mixture at the beginning of compression by opening the exhaust at E, we carry the expansion of the burning charge 50 per cent further, releasing the gases at a lower pressure, at a lower temperature and at a point nearer the end of the working stroke, more heat will be turned into work, because less will be rejected in exhaust, less power will be required to open the exhaust valves, and the function of the muffler will become extinct.

Fig. 3 shows a full load diagram of an engine carrying the expansion 50 per cent longer than the compression stroke, in which AB represents the length of cylinder and atmospheric pressure.

The piston, starting at B, the beginning of stroke drawn in a charge to G, when admission is closed, and the absolute pressure in cylinder drops to F when piston reaches A at the end of the stroke. FC represents the compression line which crosses the atmospheric line at G.

With the same clearance as an engine having a stroke BG, the compression BC, the firing line CD and the expansion line from D to E, with the same mixture and timing, would not vary from those of the

Increasing Thermal Efficiency of Automobile Engines

BY C. E. SARGENT.
Chief Engineer Lyons-Atlas Co.

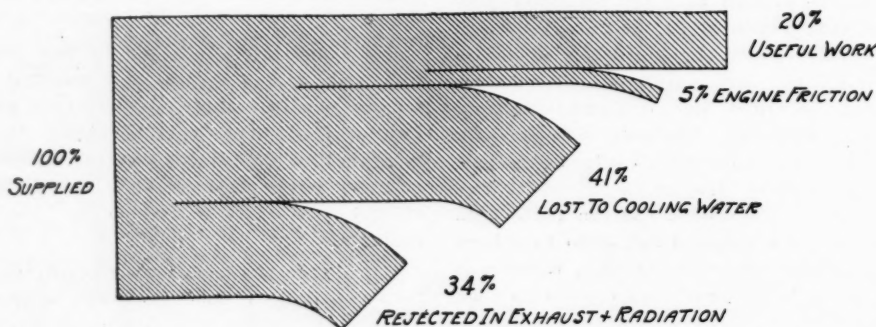


FIG. 1

Showing where the 80 per cent of heat loss in an engine goes

BEFORE automobile times gasoline was a drug on the market and the price was correspondingly low, therefore fuel consumption of the early engine was given but a passing thought, while simplicity, looks, individualism, and sometimes price, were the dominant factors more often discussed, and, as the industry developed, better engines were brought out, accessories were improved, smooth running and flexibility added, until the automobile motor of today is a most wonderful machine, yet its thermal efficiency has had but small consideration.

But with the specific gravity and surface tension of motor fuels increasing, and the price 400 per cent higher than in the horseless carriage days, one of the greatest present needs in the automobile industry is cheaper fuel, or more power from the same quantity of gasoline.

Heat Balance

In order to properly comprehend the problem of increasing the thermal efficiency of internal combustion engines

heat converted into useful work
total heat supplied in fuel
we will refer to Fig. 1, in which, of the 100 per cent of heat supplied, 20 per cent is converted into work and 80 per cent lost or rejected in friction, cooling water radiation and exhaust.

To convert more heat into work it will be necessary to decrease one or more of the losses indicated, all of which are characteristic of internal combustion engines.

With good workmanship, force-feed oiling and light reciprocating parts the mechanical efficiency is about as high as can be expected, and we may look for no further appreciable gain from that source; as a matter of fact, but 5 per cent of the total heat supplied seems a small amount for engine friction.

Water-Jacket Losses

The loss of heat to the water-jacket depends on the difference in temperature between the burning gases and the cylinder walls, the time the cylinder walls are exposed to the heat of the flame and the surface exposed. If we could maintain the combustion chamber at the same temperature as the inclosed gases there would be no difference in temperature and no transmission of heat, consequently no loss to the walls and water-jacket, but such a temperature would not only destroy all vestige of lubrication, but would melt the cylinder walls and pistons.

The time per working stroke in which the difference of temperature exists is cut down by high speed, wherein lies the advantage of high piston speed in an engine of this type.

The thermal efficiency of big guns lies in the missile speed—nearly 3,000 feet per second—while the maximum piston speed obtained in an engine cylinder probably never exceeds 40, and seldom averages over 20 feet in the same unit of time. One of the most economical internal combustion engines ever designed had a free piston,

ordinary engine, but the shaded portion of the diagram EAG would represent the gain in power, using the same amount of fuel, by expanding 50 per cent more than the induction stroke.

The shaded portion of the diagram averages 16 per cent to 20 per cent of the whole, indicating a 20 per cent to 25 per cent increase in thermal efficiency, or a corresponding increase in power from the same amount of fuel. An engine using such a cycle may weigh a little more per horsepower output, just as a long-stroke motor is heavier than an engine with a square cylinder, and on account of the long stroke per pound of M. E. P. may have more mechanical friction, but, while the cooling surface per heat unit introduced is increased, the difference in temperature during the last third of the working stroke is so slight that an additional transfer of heat seems improbable.

The exhaust of an engine expanding its burning charge 50 per cent more than its compression stroke shows but a trace of flame, an evidence of complete combustion in the cylinders, where it belongs, and a reduction of the terminal temperature of about 1,000 degrees F.

If the thermal efficiency is increased, the disposition of the rest of the heat is immaterial, though observation indicates that, while the loss in friction and water jacket is but slightly increased, the exhaust loses what the thermal efficiency gains.

The average heat balance of five full load tests from a 50-horsepower 10x20-inch engine, cutting off at about two-thirds its stroke, using the high value of fuel, is as follows:

Thermal efficiency on B. H. P.	26.02
Engine friction	4.86
Radiation and exhaust	22.59
Water jacket	46.48

Of course this high efficiency would be obtained only at full load or with an open throttle, a condition that seldom occurs in an automobile engine.

Partial Load Inefficiency

With an advanced ignition and a throttled mixture with its low compression in an ordinary automobile engine, the terminal pressure will approach atmospheric, but the loss from wire drawing and the low compression is probably more serious than the exhaust gas losses at full load.

Fig. 4 shows the diagram of the ordinary automobile engine developing but partial load with the ignition advanced to compensate for the slow burning mixture, in which AB represents the atmospheric line and the piston travel; BF the rarefaction during the induction stroke; FC the compression; CD the firing, and DA the expansion line. The shaded portion shows the back pressure or loss in every cylinder during the partial load.

As the area of the shaded part of the diagram, or the negative load, must be offset by a like amount of area above the atmospheric line, the fuel consumption of an idling engine is necessarily great, and because the average load on an automobile engine in which the intake is throttled necessarily has some back pressure, the thermal efficiency must be low.

Tests have demonstrated that an engine driving a car on a smooth road at twenty miles per hour will require no more fuel than when idling at the same speed. Every engine whose speed is regulated by the throttle opening develops a negative load which must be overcome by an equal positive pressure before it will deliver available power. This negative load decreases with a wide-open throttle, a condition, however, seldom obtained. The absolute pressure in the inlet manifold when a car is operating at about one-half its maximum speed, or say twenty miles per hour, averages about eight pounds, therefore approximately seven pounds more M. E. P. than the net load requires, is necessary under the average condition.

When idling, an engine may be working against from ten to twelve pounds back pressure, a sufficient cause for its high fuel consumption under no load.

Tests of a 4½x5½-inch six-cylinder engine in 1912 by the Automobile Club of America showed the following thermal efficiencies:

Full throttle, R. P. M. 1113	17.8%
One-third throttle, R. P. M. 1039	15.1%
One-sixth throttle, R. P. M. 266	6.2%

The loss from low compression caused by a greater surface for heat absorption per unit of volume is not shown on diagram, but manifests itself when a heat balance is obtained.

As the load becomes lighter, the compression less, and the mixture weaker from having a larger per cent of carbon dioxide, the inflammation is necessarily slower, and the desirability of an earlier ignition is apparent if the maximum efficiency under adverse conditions is desired.

While the car driver could, if he would, keep his ignition as early as possible consistent with smooth running, and in so doing maintain the highest possible efficiency, the ultimate solution of the timing problem for

our present motors, in the author's opinion, is to automatically advance the time of ignition directly as the speed and inversely as the load—a combination which will insure the best economy during all ranges of load. With a late spark and slow-burning mixture it is possible to generate more heat in the exhaust manifold than in the engine cylinders.

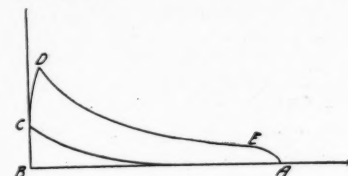


FIG 2

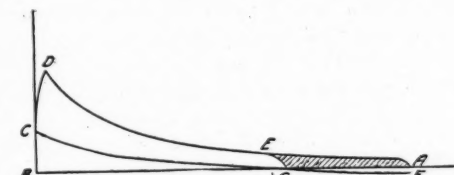


FIG 3



FIG 4

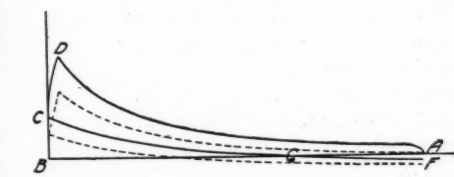


FIG 5



FIG 6

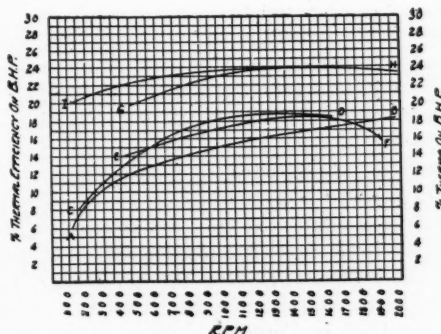


FIG 7

Indicator cards and horsepower and efficiency curves compared

In order to prevent the wire drawing loss shown in Fig. 4, closing the admission valves earlier instead of throttling the mixture will reduce the M. E. P. without creating a back pressure, eliminating light load losses except those indigenous to low compression.

If the maximum cut-off is two-thirds the working stroke (Fig. 3), other conditions being the same, and we make this cut-off earlier as the load decreases, we will maintain a higher thermal efficiency during the whole range of load than is possible in the automobile engine controlled by a throttle in the suction pipe.

A carburetor properly designed for efficiency should provide a weaker mixture as the compression increases. A mixture too weak to ignite at atmospheric pressure will fire and do work if sufficiently compressed. A rich mixture is necessary in starting and with partial load, because the exhaust product content being constant and the compression less, the combustible molecules are not sufficiently close for proper chemical action, therefore there should be more of them in the same space to get rapid and efficient firing.

Blast furnace gas having as low as 90 B. T. U. per cubic feet, making 45 B. T. U. when mixed with a like amount of air, will not burn at atmospheric pressure, yet makes an ideal fuel when compressed to 180 pounds gauge.

Air containing less than 50 B. T. U. of gasoline vapor per cubic foot will not burn at atmospheric pressure, but when compressed sufficiently high will fire and do useful work.

If the molecules of a hydrocarbon are driven too close to the molecules of oxygen by compression, the generated heat will cause spontaneous combustion, but with a weak mixture high compression is necessary to bring them to a normal ignitable relation, therefore compression may be increased indirectly with the heat units supplied.

Fuel Ratio

In a Diesel engine in which the heat of compression is always sufficient for ignition, combustion takes place even with the smallest possible injection of fuel.

It is quite evident, therefore, for efficiency in automobile engines, that the fuel per unit should be less as compression increases to prevent spontaneous ignition and conversely should become richer as the pressure decreases for a high mean effective pressure.

The higher the compression, other things being equal, the greater the thermal efficiency, yet the compression must be below the critical point of premature ignition. If we weaken the mixture as the compression increases, the relation of the combustible molecules will remain constant, maintaining practically the same rapidity of inflammation.

If a motor is designed to give a maximum compression and full rated load at two-thirds cut-off, as shown in full line diagram (Fig. 5), a better efficiency will be obtained at full load than is obtained in the ordinary automobile engine, because less heat goes out with the exhaust and more is turned into work.

It already has been shown that if the point G is moved towards B as the load gets lighter, there will be no loss from wire drawing, but as the compression decreases the efficiency will become less, the molecules further apart and inflammation slower. Therefore the ignition must be advanced to obtain the dotted diagram in which the firing line is practically parallel to CD.

Such a method of governing would materially increase the efficiency at half or partial load, which is the load most usually required of an automobile engine.

As an internal combustion engine which has no compression and fires at atmospheric pressure requires about five times as much fuel per B. H. P. hour as an engine compressing to five atmospheres running on the Otto cycle, the desirability of keeping up the compression can readily be seen.

If, instead of moving the point of cut-off G towards B, leaving the mixture practically constant but taking in less gas, as less load is required, we move the cut-off point G towards A, or to G (Fig. 6), and at the same time decrease the fuel per unit of air, the compression will be increased, rapidity of inflammation will remain practically constant, premature ignition will be improbable, the thermal efficiency should be practically as high as at full load and the initial pressure should be less, insuring smooth running at light loads.

If the fuel is diminished as the compression increases in such a manner that there will be just enough fuel at maximum compression to drive the engine idle, and at the earliest cut-off to give the maximum M. E. P., the adjustment is complete. Should the fuel diminish faster than the compression increases at the latest cut-off, there would be a negative M. E. P. of compression and the engine would stop. Between extremes, full and no load, the fuel compensa-

tion is automatic, incurring complete and smokeless combustion.

Such a cycle provides for a maximum or at least an average efficiency through the whole range of load. It eliminates the inefficiency of wire drawing and low compression. It provides a fixed fuel adjustment for full load with speed compensation only required. As the load gets lighter the fuel valve is throttled and the closing time of the induction valve retarded, a most simple mechanical problem.

In such a cycle the molecular arrangement is such that the speed of inflammation is practically constant for all loads, therefore the time of ignition need be advanced only with the engine speed to get a uniform angle to the firing line.

With such a cycle volumetric efficiency (volume of gas induced—volume of induction stroke) which governs the theoretical compression can be maintained at unity, as the flexible denominator of the equation can be readily varied.

If the compression at two-thirds cut-off and maximum load is ninety pounds absolute, the maximum compression at no load would be practically 144 pounds, yet so attenuated would be the mixture that premature ignition would be impossible.

In Fig. 7 thermal efficiency curves AB, CD and EF were obtained from tests by the Automobile Club of America of automobile engines, and probably show the average thermal efficiency of the majority of engines of this type.

While the available efficiencies of complete expansion engines are for full load and from larger cylinders, the total horsepower is practically the same as the horsepower of the engines from the tests of which the three curves were plotted.

The probable efficiency curve which would be obtained from an automobile engine expanding the working medium 50 per cent further than the induction stroke, but cutting off earlier as the load gets lighter, is shown at GH, while IH is theoretically the efficiency curve of a complete expansion engine, in which the compression is increased inversely, and the fuel directly as the load.

In solving the mechanical problem provision is made for retarding the beginning of compression when cranking, thereby introducing with the normal high compression no starting difficulties.

A standard carburetor would require no change in adjustment for full load, but would require a fuel opening which would vary inversely with the amount of air induced.

The rarefaction of the mixture in cylinder at full load induces expansion, gasification and a thorough commingling of the combustible molecules before compression, a condition which insures rapid ignition and perfect combustion.

While the thermal efficiency of complete expansion engines has been excelled only by engines of the Deisel type, there may arise unforeseen difficulties in increasing the compression inversely as the load, yet the possibility of developing an automobile motor whose thermal efficiency is at least 15 to 20 per cent higher than the best engines extant, and one in which the efficiency is as high at the partial load at which it is usually run as at full power, should be of vital interest to the automobile industry of today.

Discussion

It seemed to be the consensus of opinion of the engineers present that the points brought up by Mr. Sargent's paper were well worth study from a theoretical standpoint, and embodied more a theory whose results might be worked toward rather than a practical basis for engine design at the present day. Among the engineers who took part in this phase of the discussion were Mr. Jesse E. Vincent, the Packard engineer; Howard Marmon, of Nardynke & Marmon; Mr. Brush, of the Brush Engineering Corp.; John O. Heinze, of Heinze Electric Co.; Chester Ricker, of the Stutz Motor Car Co.; Mr. Gruenwald, chief engineer of the Moline Automobile Co.; Mr. Grimes, of the National Co., and Mr. Combs, of the Prest-O-Lite Co.

Mr. Heinze stated that the engineers were aiming to maintain the same high compression and develop the same high efficiency of fuel economy at all speeds and at all power production. In other

words, the ideal is to permit flexibility and power without sacrificing thermal efficiency.

Mr. Sargent explained that the reason for closing the inlet valve late was in the attempt to get all possible fuel efficiency out of the motor, the effort being to make the motor as efficient under low loads as under high loads.

Varying the Cutoff

Mr. Heinze mentioned a motor which he developed 2 years ago, arranged so that the time of closing of the intake valve—that is the cutoff—could be varied by having split cams. It was found that by varying the cutoff in this way it was possible to get as high as 19 per cent thermal efficiency, but not maximum power. In order to obtain the maximum power, the thermal efficiency had to drop to about 16 per cent; that is, at 28 and 30 horsepower the efficiency was 16, and at 25 it was 19.

Variable Cut-Off Not New

F. E. Moscovics, of Nardynke & Marmon, the chairman, mentioned an English engine of several years ago, which had a variable cutoff, and also stated that one of the old Wintons had a variable pressure maintained by using an air cylinder which operated in connection with the intake valve.

Chester Ricker, of the Stutz company, explained that that valve was purely automatic, a light spring just sufficient to lift the valve was so connected with a piston in the air cylinder that it increased the air pressure on the intake.

Mr. Gruenwald, of the Moline company, stated it was his belief that any increases which could be obtained in this way in the thermal efficiency of an engine by changing the cutoff would not be sufficient in the minds of owners to make up for the increased complication.

In replying to a question as to the effect on ignition of the high pressure he advocated, Mr. Sargent said he had submitted his cycle to two internal combustion engineers of high standing, one of whom prophesied premature ignition, and the other of whom said it would be impossible to obtain ignition. He believed that a compromise between the two is probably nearly correct and that he would get average good ignition.

Mr. Brush stated that the pleasure of the user is an essential factor and whether the gain in efficiency would offset the distaste of the public for an engine whose range is so restricted as that outlined by Mr. Sargent is a question.

This was followed by a discussion of ignition under high compression, Mr. Grimes, of the National, making the point that it was hard to make a spark jump the gap under high pressure, and to increase the pressure of the motor to 80 or 90 pounds makes it difficult to get a magneto which would supply a spark of proper voltage and current to jump the gap.

Mr. Combs, of the Prest-O-Lite, stated that in a former paper the point was made that 11,000 volts was necessary to overcome the pressure of 90 pounds per square inch. To this, Heinze replied that not only the voltage is to be considered, it is also the current. It takes a pressure of 40,000 volts to puncture a glass plate $\frac{1}{8}$ -inch thick, providing there is plenty of current behind it, but magneto current at 40,000 volts would not do it. He stated it was his belief that magnetos could be made which would spark in 200 or 300 pounds compression if needed.

The Commercial Aspect

Mr. Vincent, of the Packard company, stated that the public would not accept the proposed cycle even if it gives more economical operations on account of complication and restricted range. He stated that the development is toward more power out of smaller motors.

Aircraft motors in Germany were developed at the beginning of the war by motor car engineers, who produced good motors along motor car lines. They used variable cam arrangement to give higher compression for different altitudes. In France they began at the other extreme by having aeronautic engineers develop the motors. They did not have the knowledge to put in sufficient weight and material, so in the development, the motor became heavier when their fuel weight was considered, as they took more fuel than the German engines of high efficiency. Later in the war, these were turned over to motor car engineers, and now the French use engines developed along motor

He stated the Packard has two aeronautic engines under development, one of which has a bore of $2\frac{21}{32}$, and the other practically double that. He stated it was his belief that the spark plugs were the limiting feature and it was possible to carry the compression to pressures at which spark plugs would not stand up.

Darwin S. Hatch, of Motor Age, mentioned some of the development which is going on in the motor car factories in Europe looking toward expansion in trade after the war and stated, according to reports from their special correspondent in Europe that the development seemed to be along two distinct lines, one toward the multicylinder engine, more particularly the twelve, and the very light, small, high-efficiency fours in the other direction. In both of these, considerable work was being done in a development way with aluminum cylinders, somewhat along the same lines as has been worked out in this country.

In closing, Chairman Moscovics stated it seemed to be the consensus of opinion that the paper presented much food for future thought, although it was not presented as a theory of design for immediate adoption on the drafting board. The 120 engineers present seemed to feel that the paper and discussion offered a great deal of food for theoretical work.

Juvenile Motoring Apparel for the Early Spring

**Diversity of Fabrics
Used and Colors
Are Luxurious
and Abundant**

CHILDREN'S outing coats are made up this year in a great diversity of fabrics, luxurious in colors. The dark tones, however, prevail, as last year. Most of the linings are bright colored and fancy. This year the checks are greatly in demand, being found mostly in velours and fancy woollens, although other fabrics have a share in this class of patterns.

As in garments for women, the tendency this year is to offer coats that will not make the wearer conspicuous and which may be used either on the walk or in the car. In fact the effort seems to be to give garments that will be suitable to the needs of more than one kind.

Not Much Overcoat Change

Children's overcoats, as a rule, do not change materially from year to year. The only difference this year from last is that the coats are little more tight-fitting above the waist and full at the skirt and hips. Most of the coats are belted, either in one-half or three-quarter effect. Protection of the neck is afforded by the use of cape collars and neck pieces. Tweeds, wool and velour materials are the most popular, these being made up with fancy silk lining.

Sweaters this year will be popular. An entirely new model has been introduced. This is a Shetland wool middy sweater, having a laced front with a deep sailor collar in contrasting stripes to match the body of the sweater in all the fashionable



Enameled white rubber rimmed sanitary goggles with smoked lens. Price, \$2

shades. This model also has a sport pocket. Silk sweaters after this design may also be had.

Another popular model this year will be a brushed wool sweater with a half belt, convertible collar and patch pockets, finished with crocheted buttons. This model

**The Dark Tones
Prevail, But the
Linings Are Mostly
Bright and Fancy**

is loose, stretchy and of light weight, and ideal as an outing garment for girls.

Most of the children's hats are made up in straw, while some are of silk in varied colors. All of them, however, are close-fitting, plain and of light weight.

One innovation this year is a girl's oil silk coat and hat in various high colors. This coat is rainproof and is close-fitting, as most raincoats are, with a high, protecting collar, as the photograph shows.

Gauntlet Gloves Popular

Gauntlet leather gloves are popular with the children as well as with the women, and are much the same in design, being tight at the wrist, either by the use of elastics or straps. This year the gloves are shapely and comfortable and may be had in black or tan. One feature brought out is that they are positively washable with soap and water.

On the following two pages are shown the very latest styles in children's motoring apparel, the coats are of various hues and designs, as is true of the hats.

While the lines for the most part do not vary, being generally simple and plain, just as simplicity is the rule in hat design, there is ample room for the exercise of personal taste in the choice of goods and patterns.

The photographs were taken by Lazarnick, New York, and the garments, hats and gloves were made by Best & Co., New York and Chicago.



Above, chiffon motoring veil in white with 3-inch black border. It sells for \$3.75

Left, back view of girl's half sweater of brush wool with shawl collar and crocheted buttons. At the right is a front view of the same garment. These come in Copenhagen blue, rose and white, prices ranging from \$5.25 to \$5.85, according to age

Photographs by N. Lazarnick, N. Y.



What Spring Fashion Decrees for Juvenile Motorists



Cotton sport hat in tan with navy facing and with creton motive. The price is \$5



Girl's shower-proof utility coat of Scotch tweed. Sizes 10 to 16 years. The price is \$15



Fancy straw tam with straw flowers and long velvet streamers, which sells at retail for \$14.50



Girl's coat of check velour, silk lined and with cape collar, at \$29.50



Burnt straw with black velvet close hat of fancy braid, trimmed with velvet pleating. Price \$10



Back and side view of girl's check velour coat shown on the opposite page



Motor gauntlets of cape leather, \$1.75

Girl's oil-silk coat and hat in various bright colors. Sizes 4 to 14 years, \$12.75, hat included



Newest slip-on sweater in shetland wool with sailor collar, cuffs and border striped with white, light blue or rose. Ages 3 to 7, \$3.85; ages 7 to 10, \$5.50

Girl's unusual travel coat of covert silk-lined. Sizes 10 to 16 years, \$25



Imported model of straw and silk with silk cockade. In navy, silk and green straw, the price is \$13.75

Metropolitan Cup Must Be Won 3 Times

Sheepshead Bay Directors Elect to Extend Competition Over Period of 5 Years

NEW YORK, April 1—It has been decided by the directors of the Sheepshead Bay speedway to extend the competition for the Metropolitan cup, the trophy to be awarded in the 150-mile event at the Sheepshead track, May 13, over a period of 5 years instead of only 3 years. This, according to racing men, foreshadows the liveliest interest in the event, and undoubtedly will result in the keenest sort of competition.

The limit of the number of entries has been placed at thirty-two and the requirements in preliminary trials for entry have been increased from 85 to 90 miles, according to Frederick J. Wagner, director of contests, who is directing the tryouts. An important change in the rules, which will prevent any undue advantage, was announced in connection with the selections. Officials said that the practice heretofore of allowing the car which developed the greatest speed to go to the pole would not prevail. Instead, the positions of the cars for starting a race will be determined by lot. The closing date for entries will be April 20.

The contest for the Metropolitan cup will mark an innovation in automobile racing, in that the distance of the race will be only 150 miles. The distance of the other contests will be as follows: Queens County cup, 50 miles; Coney Island cup, 20 miles, and the William Kemble cup, 10 miles. Thus, the public demand for shorter races, with livelier action, will be met.

The American Automobile Association, it also was announced, has definitely decided to inaugurate, with the holding of the Metropolitan cup race, its proposed plan to keep an official record of points scored by all drivers. This is not only destined to stimulate interest throughout the country in motor racing, but is calculated to establish it as a permanent sport. The records will be kept on the same basis as the official ratings of the baseball stars, so that the organized bodies interested in automobiling in any part of the country may turn at any time to some recognized authority to ascertain the official standing of any driver. This will give an official championship rating to cars and drivers, much as Motor Age has done each year at the end of the racing season.

CHRISTIAENS TO DRIVE HERE

Paris, April 3—Special Cable—Joseph Christiaens, the Belgian who drove the six-cylinder Excelsior into sixth place at Indianapolis 2 years ago is an assured entrant with a six-cylinder Sunbeam in the 300-mile Indianapolis speedway race, May 30. The report, however, that Rene Thomas, winner of the 500-mile race on

the Indianapolis speedway in 1914, will drive a Peugeot in that race is incorrect, though the Fiat company has been redesigning two 1914 grand prix models and it was almost certain the company would enter these in the coming Indianapolis race. It is now stated that this company has decided to the contrary.

DAVE LEWIS WILL BUILD CARS

Los Angeles, Cal., April 1—Dave Lewis, who is well known in southern California because of his performances with the Stutz and Mercer, has gone to the Crawford factory in Maryland, where he and Billy Chandler will build three Crawford racing cars to be used by Lewis and Chandler this season.

CANADIAN ON PREST-O-LITE TEAM

Indianapolis, Ind., April 1—George Henderson, known as Pete in the racing fraternity, has stepped across the boundary line from Canada into the states to drive in the 300-mile race at Indianapolis, May 30, for Eddie Rickenbacher, captain of the

Prest-O-Lite team that will campaign the Maxwell cars.

Although born in Canada, Henderson has spent a good deal of his time in the U. S. A., and while not a veteran in the racing game, he has had enough experience to warrant Rickenbacher's eagerness to sign him up.

MASTER DRIVER'S RUN ANNUAL EVENT

Chicago, April 4—The 3-day reliability run for the master driver's medal, which was won last year by E. A. Turner, driving a Mercer, will be repeated this season, probably in October, and will be made an annual event. This was decided upon at a meeting of the contest board of the Chicago Automobile Club yesterday. The rules will be tightened in future competitions.

E. W. CORMAN WITH ELGIN CO.

Detroit, Mich., April 3—E. W. Corman, who was advertising manager of the Saxon Motor Car Corp. from the time the old Saxon Motor Car Co. was organized until recently, when he became sales and advertising manager of the local Saxon distributor, the Wetmore-Quinn Co., has joined the Elgin Motor Car Co., Chicago, in the capacity of director of sales and advertising.

Speedway Park Exploits Racing Team

Chicago Men Finance Ben Hur Special

CHICAGO, April 3—It is announced that the purple, white and gold banners of the Chicago Speedway Association will be carried by a racing team to be known as the Ben Hur Special, whose chariots will be three of the classiest ever put on tires in America.

President Reid has secured an option on all the common stock of the Speedway Park Association, a move which will eventually release it from the hands of contractors, who now hold all the ordinary shares outstanding. All other securities are in the form of membership certificates, which consist of units of twenty-five shares, accompanied by cards of membership.

Attorneys for the organization have recently incorporated a company with a capital of \$100,000, headed by Mr. Reid, which will sponsor the Ben Hur Special and develop a team of speed specialists to pilot the cars, it being proposed to have Chicago represented by the Ben Hur Special at all big meets.

New machines are expected to be ready for the races in New York and Indianapolis next May. An engineer whose name is withheld has designed an engine which is believed capable of maintaining a speed of 125 miles per hour on any track fast enough to permit a continuous pace like

this and has supplied the specifications from which the motors are to be constructed. According to some informants, the engine is similar to that of the Delages driven in the 1914 French Grand Prix and since purchased by a New York sportsman, Harry Harkness. A peculiarity of the motor used by the French team was that the valves opened positively in both directions, being closed as well as opened by the cam.

NINE ENTRIES FOR AMATEUR RACE

Chicago, April 3—With the Chicago amateur driver's race over 6 weeks away, there are twenty-five entries promised and nine actual entries for the event. Those who have actually signed the entry blanks and deposited the fees are as follows:

DRIVER AND CAR	CLUB
F. C. Sawyer, Mercer	South Shore Country Club
William Leet, Mercer	Omaha Automobile Club
Dr. R. R. Duff, Mercer	Central Dist. Mfg. Club
Herman W. Mershback, Packard	
.....	Chicago Automobile Club
C. H. Robbins, Mercer	Speedway Park Assn.
William Robbins, Mercer	
.....	South Shore Country Club
E. C. Church, Cadillac	Speedway Park Assn.
Frank Warner, Cadillac	Speedway Park Assn.
A. W. Bronstedt, Mercer	
.....	Chicago Automobile Club
Harold Scott, Locomobile	
.....	Chicago Automobile Club
Ernest Haig, Simplex	Speedway Park Assn.

These are subject to invitation from the officials after the non-professional standing of the entrants and the eligibility of their cars have been determined by the

qualifications and eligibility committee. Entries already have been received for six Mercers, and as only five of one make are permitted, by the A. A. A. rules, to start, not over five will receive invitations.

CORONA ENTRY LIST COMPLETE

Corona, Cal., April 3—Several of the drivers who will start in the boulevard race on the Corona course, April 8, were on the track today, warming up for the big classic, the first official practice runs being made this afternoon. From their showing in the trials, it is easy to believe that every machine entered will come up to the 100-mile notch.

On his first trial trip over the course, April 1, Hughie Hughes, in his Sunbeam, made a lap at a speed of 107 miles per hour. Earl Cooper, on the Stutz, drove a lap at 99 miles per hour, and Eddie O'Donnell, with a Duesenberg, did 95 miles per hour.

The entries closed April 4. The list includes the following drivers and cars:

Delage, Barney Oldfield; Mercer, Eddie Pullen; Peugeot, Bob Burman; Stutz, Earl Cooper; Milac, Tetzlaff; Duesenberg, Eddie O'Donnell; Omar, Omar Toff; Sunbeam, Hughie Hughes; Cyclone, R. C. Durant; Mercer, Thomas; Gandy Special, Waterman; Gandy, Lou Gandy; Apperson, Price; Edwards Special, Edwards; Marmon, Welsh; Tahais, Teel.

HUPP MAN GOES TO CHINA

Detroit, Mich., April 1—Vice-President Charles Denby, of the Hupp Motor Car Corp., is now en route for China, where he expects to remain about 6 months. Mr. Denby was formerly United States consul-general at Shanghai, and has lived in China for 22 years. He has numerous interests in the Orient.

S. A. E. Standardizes Economy Tests

Establishes Rules Governing Gasoline Mileage—Measures to Be by Weight

BUFFALO, N. Y., April 1—The Society of Automobile Engineers has, through its Standards committee, taken a hand in fuel economy demonstrations. At a meeting held here today rules were drafted governing fuel economy demonstrations, in order that some standard form of test could be arrived at, making it possible to compare a test conducted in Chicago with one in New Orleans, New York, Atlanta, or Minneapolis. Complete details of the test have not yet been drafted, but will be at the next meeting of the Research Division, which has the work in charge.

It was decided that only rigid tests would be of any value and that these should include acceleration, as well as mileage. It was the consensus of opinion that these tests should be conducted on speedways, as conditions vary less than on roads.

It was not fair to allow just one speed to be chosen, as that would allow the car-buretor to be adjusted for that particular speed. The following schedule is suggested:

M.P.H.	Distance	Time
10	10	0:40
15	10	0:40
20	10	0:30
25	10	0:24
30	10	0:20
40	10	0:15
50	10	0:12
Total	70	2:41

Each run is to be repeated in the opposite direction, that is, two runs at 10 m. p. h. will be made, then two at 15 m. p. h., and so on.

When all the gasoline consumption runs have been made there must be an acceleration test, the results of which must be entered on the test form, together with the consumption figures; this being to guard against the use of phenomenally weak mixture.

There are many other restrictions. For instance, it is laid down that the cooling system must be fully operative, meaning that the radiator must be full, that the fan must be running and no blanketing of the radiator will be allowed. Once set, the mixture must not be altered throughout the whole test, including the test for acceleration.

The division recommend a particular arrangement of fuel tanks for the test, consisting of two special tanks carried on the back of the windshield. Of these, one is weighed before the start of each stage of the test, and the other is used for intermediate running, an arrangement of two cocks allowing the switch from one to another to be made instantly. It was decided to recommend weight measurement, as this is so much more simple and accurate than volume measurement, and weight is easily translated into pints and gallons afterwards.

TO TALK ON RACING MOTORS

Chicago, April 4—Racing motors is to be the feature of the first regular meeting of the Mid-West section of the Society of Automobile Engineers at the Chicago Automobile Club next Friday evening. President Charles John, of the Wisconsin Motor Mfg. Co., will present a paper on racing motors.

Since the Wisconsin concern was the builder of the engine used in last year's champion racing car, it is to be expected that he knows probably more than any other man about putting the last iota of speed into an engine. As this meeting comes just at the beginning of the racing season, the subject should be of particular interest and it is expected that there will be some lively discussions develop from Mr. John's talk.

The second half of the meeting will be the first of a series of freight transportation by motors and Friday's meeting will take up the subject from the truck users' side, the several phases of this important division to be given in detail.

During the intermission between the two main discussions of the evening there will be an exhibition of model aeroplane flights by the Model Aeroplane Club of Illinois. This first meeting will be open to every one interested and will not be restricted to the members of the Mid-West section.

Federal Aid for Roads in 43 States

Bankhead Bill Gives Impetus to Movement

WASHINGTON, D. C., April 1—Forty-eight states will qualify for federal aid in roads under the Bankhead bill, recently reported favorably to the senate by its committee on postoffices and post roads.

Indiana, South Carolina, Georgia, Mississippi and Texas are the five states which have yet to equip themselves with a centralized direction of roads improvement. Indiana has an active campaign in progress which ought to prove successful, energized in great degree by the Hoosier State Automobile Association, which is affiliated with the American Automobile Association.

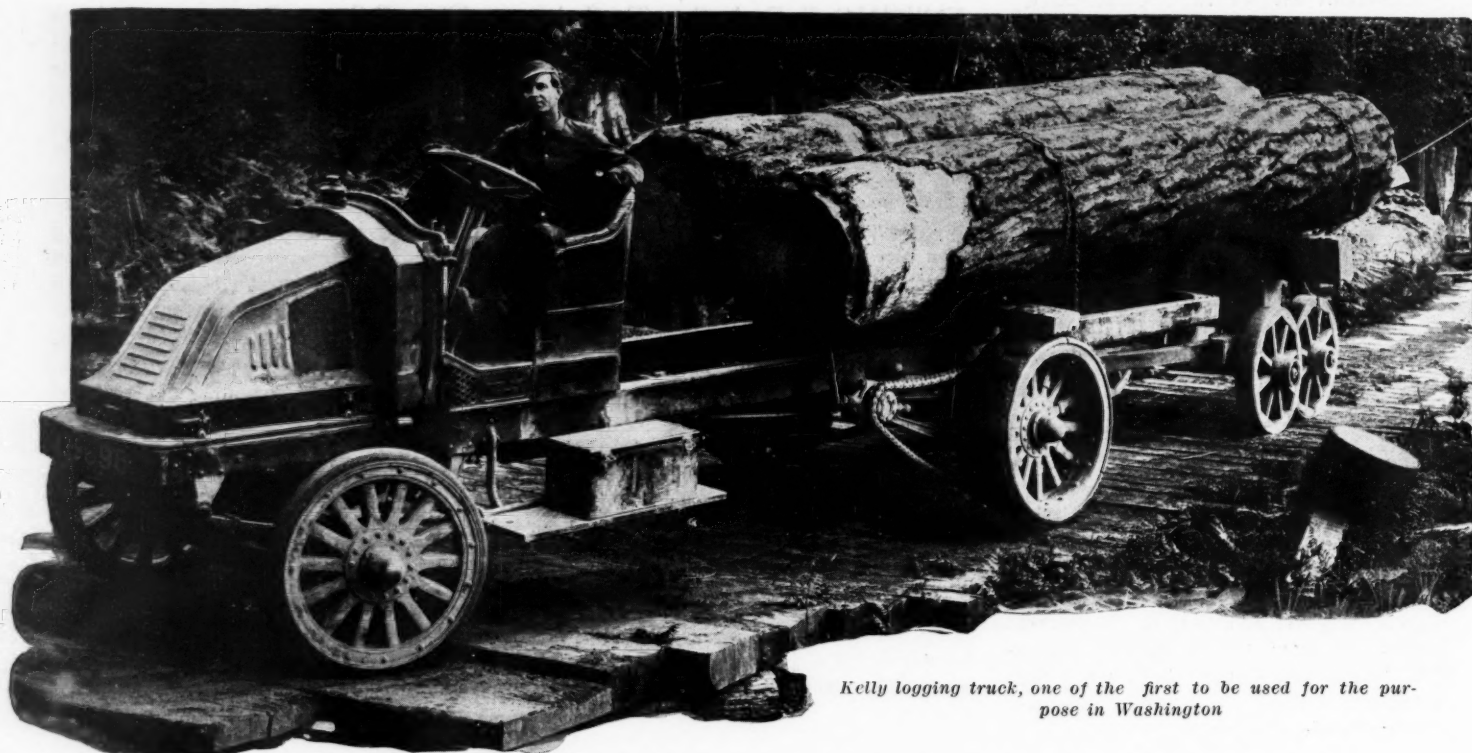
South Carolina is giving the question of a state highway department serious consideration. Georgia is in an equally hopeful condition, while Mississippi in its house of representatives recently voted against the creation of a state commis-

sion. The legislators opposed the legislation because it called for an engineer with a salary of \$2,500 a year. Maine pays \$5,000 and possesses an unusually competent official.

Texas, under the Bankhead measure, would obtain more federal coöperation than any other state in the union, its area taking it into first place, though it falls behind many other states in population and road mileage. It is a certainty that Texas will provide a highway department within 3 years, for section 3 of the senate measure contains this proviso: "except that amounts apportioned for any fiscal year to any state which has not a state highway department shall be available for expenditure in that state until the close of the third fiscal year succeeding the close of the fiscal year for which such apportionment was made."

Logging by Motor Truck Where Horse Is Useless

"Toothpicks" That Weigh 14 Tons, Cut in Forests of Washington, Are Play-Things for the Powerful Five-Wheelers



Kelly logging truck, one of the first to be used for the purpose in Washington

SEATTLE, Wash., March 25 — Motor trucks in the forests of Washington are entering a field that heretofore has been immune from the imprint of even horses' hoofs. They are blazing a trail of their own, and incidentally starting one grand trek back to the soil. The results have been startling.

These mechanical horses of the logging camps transport huge logs from the forests to the railroad and to the mills direct. The powerful motor trucks are performing a duty that, in this section of the United States, at least, the horse has been unable to perform. And not only that—they are speeding the giants of the forest to the mills so quickly that hundreds of thousands of feet of timber ordinarily consigned to the bonfire of stumps are being sold, and at good profit.

Epoch-Marking in Transportation World

Thus the logging truck is performing a dual benefit. But even a more far-reaching good is coming from this epoch marking event in the transportation world. The acceleration of the process of clearing rich agricultural land of timber is a great advantage to the state and nation. It means the quickening of the movement back to the soil.

Take the rancher, for instance, who has cleared off a good-sized area for agricultural purposes. He has from 20 to possibly 100 or 200 acres of additional land that contains some excellent timber. Standing in the forest it scarcely is valuable enough

By Frederick Wagner

to justify erecting a saw-mill. To build a logging railroad to transport the logs to market would be so costly as to make it impracticable. The rancher utilizes only what timber he needs for fuel purposes. The remainder is a white elephant on his hands, for logging by horses, too, is an economic problem.

So, the land owner invariably is in a quandary as to what to do with his timber.

Comes now the powerful logging truck, operating rapidly and inexpensively and carrying huge loads. It can rush the logs to market and obtain good prices, the rancher gets some revenue from his otherwise valueless timber, and his land is cleared as if by magic. The result is profit for all—for the rancher, the truck operator—some of them are clearing \$35 per day after deducting all expenses, including depreciation—and the mill, which is eager to get the logs.

Operating in the forests adjacent to Seattle are no less than ten of these modern mechanical steeds. They have been in daily use for periods of from 3 months to 2 years. They have worked under greatly varied conditions of travel and in all kinds of weather. They have demonstrated beyond all doubt their adaptability to this gruelling service and are a permanent fixture in the transportation field in this section of Uncle Sam's domain.

Prominent among the makes of trucks

pioneering in this new industry are the Kelly, White, Mack and Locomobile which range in size from 3 to 5 tons.

An automobile trip of 20 or 25 miles from Seattle over splendid highways brings one to the very heart of the forests where are thousands of giant fir trees. One is frequently reminded that he is in the timber belt by the periodic screech of the logging-engine whistle.

A Trip Through the Woods

Turning off the main highway and following a hard-packed temporary road, the car bearing the representative of Motor Age came to a clearing in the maze of giant trees. The crew of a logging engine in charge of one man, who was assisted by several husky men in the forest a hundred yards away, were busily engaged in preparing for the truck's arrival. The men were fastening cables to huge logs. There was an ear-piercing blast of the whistle, and a big fir came grinding and crashing through the brush, and, with lightning rapidity and accuracy, it was deposited upon a big pile of timbers.

Down the temporary road came rattling noisily, with the exhaust of the motor adding to the warning of its approach, a 5-ton motor truck and trailer. Several minutes later it had completed a small loop and was standing beside the loading platform.

The driver and his helper dismounted from the trucks, and, assisted by two members of the forest crew, hurriedly fastened

the cables to one of the Washington "toothpicks." The engine attendant was given the signal to hoist. In a flash a massive log rolled into place on the truck and trailer.

A workman with notebook and measuring stick leaped upon the truck and measured the log. It was 20 feet long and more than 60 inches in diameter. The rule credited the toothpick with containing 3,597 board feet of lumber, which at an average of 8 pounds to the foot, made it touch the scales at 28, 776 pounds.

Three minutes after the truck had arrived at the platform it was loaded and ready for the rush to the railroad siding. The motor of the big truck emitted a defiant roar and started away with its weighty cargo.

Over $3\frac{3}{4}$ miles of highway the car sped, running at a speed of 8 miles per hour. Soon it was at the railroad siding. Here a cable was hooked to the giant of the forest, and, with a mighty thud its 14-ton package struck the ground, ready to be loaded on a flat car and taken to the mills.

Trucks Work Rapidly

The discharging process required but a matter of several minutes, and the vehicle was on its way back to the logging camp. Its second load consisted of a giant fir containing 3,474 feet of lumber and weighing slightly less than 14 tons. The third trip produced a 10-ton log containing some 2,500 feet of lumber.

And so on, the truck continued. The three and a quarter mile run with the truck loaded required about one hour and

ten minutes; and the return trip, empty, consumed about thirty-five minutes. The round trip, including loading and unloading, averages about two hours. In an ordinary day's work the truck will handle at least 15,000 feet of lumber, or approximately 60 tons. Some times a single load runs as high as 20 to 25 tons, particularly when a number of small logs are carried.

To handle such tremendous weight properly and economically, it is necessary to use staunch trailers, of which there are several types. The first ones pressed into service in the logging business were four-wheel trailers. Some of the latest models are of the tractor type.

The trailer used near Enumclaw, Wash., mentioned in this article, has front wheels with a diameter of 40 inches, and 10-inch steel tires. The rear wheels measure 48 inches across and have 14-inch tires. The truck is equipped with the same sized wheels.

While the truck in particular has a rated carrying capacity of five tons, it handles 10, 15 and 20-ton loads with ease because of the sharing of the burden with the trailer. Near Enumclaw there are several grades running as high as 5 per cent, and never has any trouble been experienced. The same condition is true of the district east and north of Seattle where a number of the logging trucks are in use.

The introduction of the motor truck in the logging fields, was not made to the tune of sweet music; most assuredly not. County commissioners held up their hands in horror. The roads would be utterly ruined by the trucks alone, they cried. Carry a 15 or 20-ton load on our new high-

ways? Ruinous, absolutely, was their positive decision.

Facts, figures and arguments availed but little, till persistence finally won, and the commissioners agreed to witness a demonstration.

It took just two trips to completely upset their wild hallucinations on the subject. Now the commissioners are boosters for the trucks, for they have learned that the wide wheels are a benefit instead of a detriment. They fill in and thoroughly pack down the ruts made by narrow tired wagons with the same effect as that produced by a steam roller. It is interesting, too, to observe that the best roads in the vicinity of Enumclaw are those over which the wide tired trucks operate.

Not only that—the county commissioners have used the trucks on several occasions to haul drags over the roads after a hard rain.

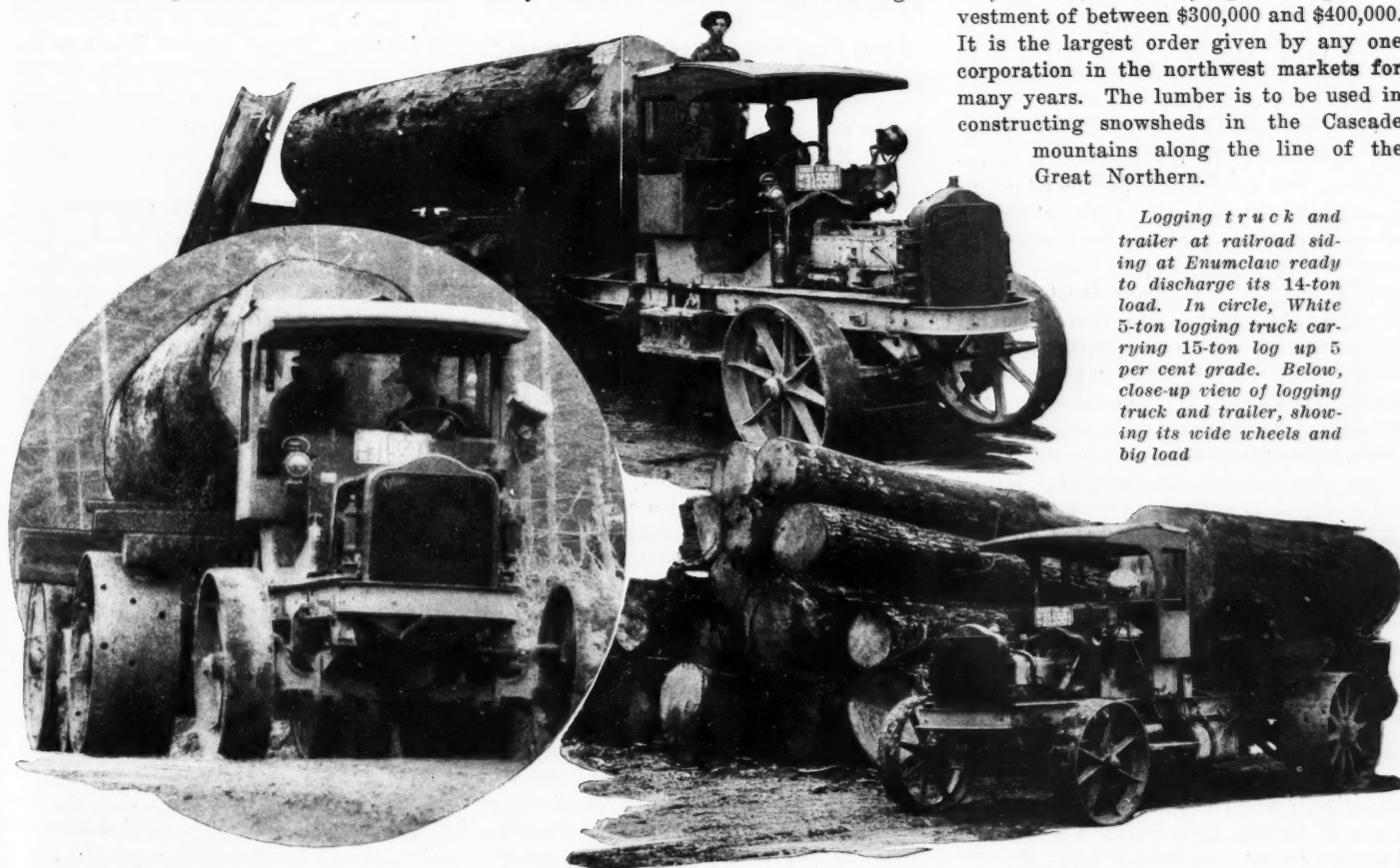
That, in brief, is what Washington has learned about motor trucks for hauling logs. It is not surprising therefore that the fleet of these carriers is increasing.

With lumber commanding higher prices than at any time in the last several years and with a shortage of logs in the Puget Sound district, the truck business has received a tremendous impetus. Operators of logging machines are making big money, and the mills are paying timber owners good prices.

Big Market Open

In addition to the heavy orders being placed by a number of eastern railroads, the Great Northern Railway Co. has announced that it is in the market for 30,000,000 feet of lumber, representing an investment of between \$300,000 and \$400,000. It is the largest order given by any one corporation in the northwest markets for many years. The lumber is to be used in constructing snowsheds in the Cascade mountains along the line of the Great Northern.

Logging truck and trailer at railroad siding at Enumclaw ready to discharge its 14-ton load. In circle, White 5-ton logging truck carrying 15-ton log up 5 per cent grade. Below, close-up view of logging truck and trailer, showing its wide wheels and big load



Exposition After War Reconstruction Program of Al- lies to Begin with Exhibition Open to Motor Cars

Provision Is Made for Showing American-Made Vehicles

PARIS, March 20—Motor vehicles will play an important part in the great work of reconstruction which must follow the declaration of peace in Europe. Preparations for undertaking this tremendous task are already well under way and include expositions such as the Reconstruction Exposition, to be held during the latter part of May and through June and July, and the fair and market now being held in Agricultural Hall, London.

The Reconstruction Exposition, which will be held on the terraces of the Tuileries Gardens and the Halls of the "Jeu de Paume," will be very broad in scope and will be open to exhibits of motor cars and trucks, parts, accessories, etc.; in fact, anything which is admitted to a motor car show in the United States. The exposition is semi-official in character and all goods destined for the display have preference over all others on the French lines to Bordeaux and on the railroad to Paris. Fifteen days' notice to the general agent in New York is necessary, however, to secure this preference. The same applies to New Orleans, where the same preference is given. The secretary of the exposition suggests that it would be advantageous for motor car concerns desirous of sending exhibits to co-operate with the chambers of commerce in their respective cities and group their shipments in order to have them arrive at New York or New Orleans at about the same time.

Several Nations to Exhibit

The secretary also declares that those exhibiting will do a larger business than at most of the American shows for not France alone, but many other European countries, such as Spain, Portugal, Egypt, Italy, Greece, etc., will be represented by people anxious to buy cars and to secure agencies. He points out that reconstruction in Europe will bring American manufacturers many times more business than the war orders but that buyers here will not purchase unless they can see a sample.

The demand for American cars selling under \$1,000 is entirely beyond the belief of Americans. They are wanted all over Europe by the thousands. Many people are endeavoring to secure parts to assemble them here to meet the demand for cheap cars.

Europeans do not realize the wide use American farmers make of their cars as farm implements, for sawing wood, pumping water, using them as tractors, etc., and if they could be shown some of these possibilities the market would be correspondingly widened. Farm tractors will be in immense demand in Europe after the war

and American manufacturers will have enormous opportunities in introducing their machines if they make the direct effort necessary to bring them before the European farmers.

MARYLAND MEASURE UNPOPULAR

Baltimore, Md., April 1—Perhaps the most drastic and unreasonable motor truck taxation bill ever read has been introduced into the Maryland legislature by Senator Bennett, of Wicomico county. The bill would tax motor trucks which are operated over state or state-aid roads for the carrying of freight on regularly-constituted time schedules, in Maryland, according to the ton-mileage they make and also by the mile, and would restrict the load per inch width of tire to 500 pounds.

The real meaning of the proposed legislation is apparent when by computation it is ascertained that a 5-ton truck, making 50 miles per day and delivering 25 tons would be charged \$4,124.99½ per year for the privilege of operating over the roads for which privilege the truck owner already pays in his general taxes.

The moneys so raised are to be applied to the roads, according to the plan of the genius from Wicomico county.

The fees called for are as follows:

Trucks weighing less than 3 tons, carrying capacity included, 1/10 cent per ton-mile, multiplied by the total number of miles which the application for the license shows will be traveled by the truck during the year for which the license is issued.

Trucks weighing over 3 tons and not more than 6 tons, ¼ cent per ton-mile, multiplied by the total number of miles to be traveled by the truck during the year for which the license is issued.

Trucks weighing over 6 tons and not more than 12 tons, 1/6 cent per ton-mile, multiplied by the total number of miles to be traveled during the year for which the license is issued.

KING COMPANY HOST AT BANQUET

Detroit, Mich., April 3—Motor parts manufacturers and their representatives, to the number of 350, were guests of the King Motor Car Co. last week, at the Hotel Statler, in attendance at the King's third annual speedfest. Artemas Ward, Jr., president of the King company, made the only address of the evening.

OHIO MOTORISTS' CONVENTION

Akron, O., April 3—Forty motor clubs were represented at the annual convention of the Ohio State Automobile Association here, March 31.

The Akron Automobile Club was host to visitors at a banquet on that evening. Afterwards, the delegates were taken in motor cars for a night visit to the Goodyear plant, where a midnight lunch was served. The following day the delegates had luncheon at the Goodyear factory. A drive about the city and visits to all of the rubber factories.

A demand for a federal investigation of the rapid advance in the price of gasoline was contained in a resolution adopted at the annual meeting of the Ohio State Automobile Association. That an embargo on exportation would relieve the situation is one of the points made. It is pointed

out that motor cars in the height of the touring season consume only 40 per cent of the gasoline output, that 50 per cent is exported and that large quantities are being stored.

Another resolution asks motor clubs in the United States to join a movement for a national touring week, the week beginning July 1, to be known as "See America First" week. Another demands a general lighting law for all horse-drawn vehicles. The question of securing a state law permitting motorists to turn out their front light and only display rear lights when the car is left standing was discussed.

ELECTRICAL VEHICLE DAY

Chicago, April 3—A day has been set aside for discussion of electric vehicles at the forthcoming convention of the National Electric Light Association, which will take place in Chicago, May 22 to 26. The session will be held at the La Salle hotel. Among those who will read papers are W. P. Kennedy, New York, consulting transportation engineer; P. D. Wagoner, president General Vehicle Co.; E. P. Chalfant, eastern representative Anderson Electric Car Co.; S. V. Norton, manager truck tire sales department, B. F. Goodrich Co.; F. E. Whitney, general manager Commercial Truck Co. of America; C. W. Squires, Jr., sales manager General Vehicle Co.

ROBINSON TO BUILD TRACTOR

St. Louis, Mo., March 31—The Robinson Fire Apparatus Co., of St. Louis, will soon commence production on a heavy commercial tractor and a line of large-capacity trucks. The tractors are to be of a design especially adapted to army use.

Henry E. Vogel, ex-vice-president and general manager of the St. Louis Car Co., will be placed in charge of Department C of the business, which will be devoted to the production of commercial vehicles.

PREPAREDNESS BY CENSUS

Washington, D. C., March 31—Preparedness for war by means of a cataloging of the resources of American industry through an industrial census is the work being undertaken by the Naval Consulting Board. In furthering this plan the board has enlisted the co-operation of the Associated Advertising Clubs of the World.

The census will start in May, and will be conducted by a force of 30,000 engineers, it is stated, who will take the information on special forms approved by the Army and Navy departments. The plan also contemplates applying Martin Gillen's plan of industrial mobilization, by which a large number of manufacturers will be given small yearly contracts for war supplies, by which each may become skilled in the production of such supplies and will have an incentive to properly equip himself. The plan will be worked out by learning the actual capacity for munitions and supplies possessed by American industry; to organize these

plants by the Gillen plan, and then to organize skilled labor.

In every state a board of five directors chosen from the membership of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, the American Institute of Electrical Engineers and the American Chemical Society.

Howard E. Coffin, chairman of the naval consulting board's committee on industrial mobilization, is the head of the movement, and W. S. Gifford, chief statistician of the American Telephone & Telegraph Co., will direct the work.

CHICAGO TAXI RATES CUT

Chicago, April 3—The Walden W. Shaw Livery Co. put into effect yesterday a new meter rate of 30 cents for the first one-third mile, and 10 cents for each one-third mile succeeding. This rate is said to be lowest ever made in the history of the livery business by a company offering the conveniences that the Shaw company does.

The hour rate for limousines, one to six passengers, is reduced to \$3 per hour, a reduction of 25 per cent. This is the lowest hour rate for six-passenger limousines in the United States.

TROY TRAILERS AFTER VILLA

Troy, O., March 31—The United States government bought eleven 2½-ton and one 1½-ton Troy trailers for use in the punitive expedition against Villa in Mexico, on March 21. The army department was in urgent need of them for the quartermaster's use in getting supplies to the troops in the field.

These trailers were shipped by a special train which left Troy on Friday evening, about 5 o'clock, and was reported as arriving at El Paso on March 28, having made passenger train time on the trip. This train had the right of way over all others, and, as a result, delivery was made on pretty near record time.

There was not time enough to give the finishing touches in the factory and a squad of painters was sent along to give them the second coat on the run and also to stripe them.

These trailers were equipped with escort bodies and are to be used in connection with Jeffery quads. A train load of quads was scheduled to meet the trailers in El Paso.

APPROVE RIVAL DIXIE ROUTES

Cincinnati, O., April 4—The two rival routes which have been bidding for official recognition by the Dixie Highway Association, will both be given recognition, upon the condition that improvements recommended by the directors of the association be carried out in the next 12 months. The inspection tour of the officials led to this decision, since each route has merits which the other cannot claim. The Wavercross road is the shorter,

measuring 258 miles. This is 92 miles shorter than the Savannah-Milledgeville branch, while the latter road possesses a historic interest in being the route taken by Sherman in his celebrated march. It has great scenic attraction also.

COMPLAINANT SEEKS ACCOUNTING

Streator, Ill., April 1—A bill for accounting has been filed in the La Salle county circuit court by John C. Barlow, Los Angeles, Cal., a former member of the bankrupt Streator Motor Car Co., against his former business associate, Paul R. Chubbuck, of Streator.

It is said that the complainant was at one time the wealthiest resident of Streator, but a heavy loss in connection with the operation of the Streator Motor Car Co. forced him to surrender most of his estate to the creditors of the plant, and to encumber the remainder. Barlow asserts that a note for \$37,500, given by Chubbuck, has been unpaid, and also other indebtedness amounting to several thousand dollars for which the defendant is alleged to be responsible.

Barlow is author of the assertion that the Peoples Bank of Streator is holding property belonging to Chubbuck and asks that the defendant be forced to make an accounting and that his interest in the property be held by the bank be set forth, so that the note can be made collectable.

TO MAKE DETACHABLE RIMS

Detroit, Mich., April 1—Plans are being formed, it is asserted, for a \$1,000,000 corporation to manufacture the new Berry quick detachable wheel rims for motor car wheels. The rim does away with need of demountable rims, it is stated. Patents for the product are held by James Berry, 165 Michigan avenue, Detroit.

McCULLA TO MEXICO

Detroit, Mich., March 30—Wm. R. McCulla, aircraft motor engineer for the Packard Motor Car Co., has gone to Mexico to render assistance to the government on mechanical and aerial transport, believing that the experience gained during his 10 months' visit in the European war fronts will be of valuable assistance to the United States government, especially at the present time.

NO BAN ON TIRES

London, England, March 29—In the house today, Capt. Ernest Pretymann, parliamentary secretary to the Board of Trade, said there was no present intention to prohibit importation of tires for motor cars and bicycles, but he could give no undertaking as to the future. Mr. Pretymann had been asked whether, in view of the large amount of tires imported from the United States, the Board of Trade intended to continue to allow them to come in.

Canadian Motor Trails

Where Ox-Carts Crept Over Roads of Old, Farmers Today Drive Cars

Wealth of Region Hastens Growth of Motor Car Business

OUT on the Manitoba prairies, where well-paved roads run like wide ribbons through the vast wheat fields, lie here and there wrecks of those old Red river ox-carts that brought overland the pioneers of the Canadian West. Bulky, wide-wheeled, crude as the carts of the interior of Asia, they creaked over the trails where motor cars travel today.

In Manitoba alone the use of motor cars is a remarkable indication of the development of the province, particularly of its rural districts. During the first eight months of 1915, before the harvesting, there were purchased in western Canada 8,000 motor cars, representing a purchase price of \$9,000,000. Of these cars 2,000 were purchased for Manitoba, representing an outlay of \$2,000,000. When it is remembered that these sales were all made prior to the harvesting of the 1915 crop, which has been the bumper crop of the west, it will be seen that the 1915 sales recorded have not been dependent upon the great wave of financial success attending the large harvest, but have been the normal purchase of the country.

Farmers Have Motor Cars

From the motor business Manitoba receives \$100,000 annually as the government's part of the fees. Up to the end of September, 1915, licenses had been issued in the province to 9,000 machines. It is believed that the records for January, 1916, will show that between 9,200 and 9,500 licenses will have been issued. The increase in licenses over 1914 registers 2,000, the licenses in 1914 totaling only 7,000 as against the 9,073 for 1915. As the province requires a straight license fee of \$10 a car, so that the fees have aggregated \$90,730 for motor cars alone. In addition owners of 890 motorcycles have been taxed \$2 each, and 1,114 licenses at \$5 each have been issued to chauffeurs.

Nearly one-fourth of the motor car owners registered for Manitoba licenses set themselves down as farmers who emigrated to Canada from the United States only a few years ago, taking up government land, or purchasing it from the Canadian Pacific on the 20-years-to-pay plan of that railroad.

The increase of the use of motor cars in Manitoba is typical of the increase in the traffic throughout western Canada. Hardly a town on the prairie does not boast several cars. Hardly an old trail is not being constantly traversed by the motor cars that roll over roads blazed for them by the heavy wheels of the pioneering ox-carts and the success of the men who came to the west in them.



The Motor Car Repair Shop



How High Altitudes Affect Engines

Loss in Efficiency Greater as the Car Continues Upward Toward the Summit

ANY given engine will show less power in mountainous country of high altitude than it will deliver at sea level, and this has caused a great deal of questioning. In fact, many car owners in mountainous districts have complained from time to time that their cars do not perform as well as they should, lacking their rated power and speed.

There is a good reason for this, and it is a physical impossibility for the engine to do otherwise. The difference is due to the lower atmospheric pressure the higher up we get. That is, at sea level the atmosphere has a pressure of 14.7 pounds per square inch; at 5,000 feet above sea level the pressure is approximately 12.13 pounds per square inch, and at 10,000 feet it is 10 pounds per square inch. From this it will be seen that the final pressure attained after the piston has driven the gas into compressed condition ready for firing is lower as the atmospheric pressure drops. This means that there is not so much power in the compressed charge of gas the higher up you get above sea level.

An Assumed Triangle

For example, suppose the compression ratio to be $4\frac{1}{2}$ to 1; in other words suppose the air space above the piston to have $4\frac{1}{2}$ times the volume when the piston is at the bottom of its stroke that it has when the piston is at the top of the stroke. That is a common compression ratio for an average motor, and is chosen because it is considered to be the best for maximum horsepower and in order that the compression pressure will not be so high as to cause pre-ignition.

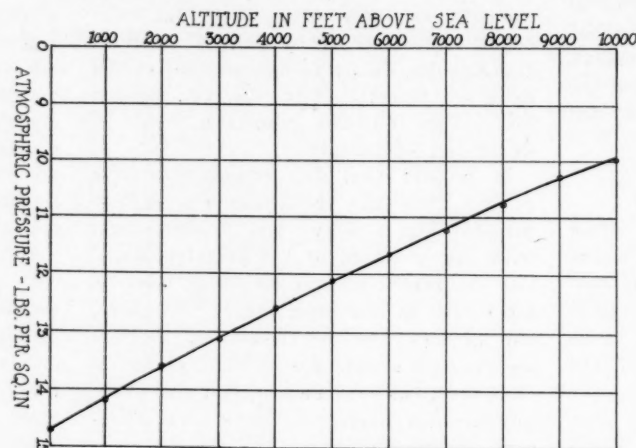
Knowing the compression ratio, we can determine the final pressure immediately before ignition by substituting in the standard formula:

$$P^1 = P \left(\frac{V}{V^1} \right)^{1.3}$$

in which, P is the atmospheric pressure; P^1

is the final pressure, and $\frac{V}{V^1}$ is the compression ratio, therefore, $P^1 = 14.7$

$(4.5)^{1.3} = 104$ pounds per square inch, absolute.



Curve showing approximately how the atmospheric pressure drops with the increase in altitude above sea level

That is, 104 pounds per square inch is the most efficient final compression pressure to have for this engine at sea level, since it comes directly from the compression ratio.

Now supposing we consider that the altitude is 7,000 feet above sea level. At this height the atmospheric pressure is 11.25 pounds per square inch, approximately. In this case we can again substitute in the formula, using the new atmospheric pressure figure. The equation becomes:

$P^1 = 11.25 (4.5)^{1.3} = 79.4$ pounds per square inch, absolute. Therefore we now have a final compression pressure of only 79.4 pounds per square inch, which is considerably below the pressure we have just found to be the most efficient for the motor. The resulting power drop is evident.

It should be borne in mind that these final compression pressures are absolute pressures, that is, they include the atmospheric pressure. In the first case, to get the pressure above atmospheric you would subtract 14.7 and in the latter 11.25 would have to be deducted. In other words, where the sea level compression is 89.3 pounds per square inch above the atmosphere, the same motor will have only a compression pressure of 68.15 pounds per square inch above the atmosphere at 7,000 feet elevation.

From the above, it is evident that in order to bring the final compression pressure up to the efficient figure we have determined, a different compression ratio would have to be used. That is, the final volume would have to be less, and as it is impossible to vary this to meet the conditions of altitude, the loss of power cannot be helped except by the replacing of the standard pistons with some that are longer above the wrist-pin so as to reduce

Change Caused by Low Atmospheric Pressure—2 Pounds Less at 1 Mile Up

the space above the pistons when on top center. Then if the ratio is thereby raised to some such figure as 5 to 1, the engine will again have its proper final pressure, but it will still not have as much power as it would have at sea level, since the horsepower varies directly with the atmospheric pressure, final compression being kept constant. That is, at

7,000 feet the horsepower of an engine that had 40 horsepower at sea level would be equal to

$$\frac{11.25}{14.7}$$

$$= 30.6 \text{ horsepower.}$$

$$14.7$$

If the original compression ratio of 4.5 were retained, the drop in horsepower would be even greater than this.

These computations and remarks will make it clear that the man who contemplates buying a car for high altitude use should see to it that it is of sufficient power to compensate for the drop that is inevitable when it is up in the mountains. This is often illustrated in stationary gas engine installations. An engine that had a sea level rating amply sufficient for the work required, might not be powerful enough when brought up several thousand feet.

Generator Must Be Connected to Battery

Never operate the generator of any starting and lighting system when not connected to the battery. Owners often make the serious mistake of taking the battery out of the car and then driving the machine or running the engine. This should never be done because you are then running the generator on open circuit, which is very injurious to the windings. Imagine what would happen if you were to securely plug the outlet from a water pump and then continually operate the pump. The force of the water would break the pump. This is analogous to what would happen to the electric generator. The energy that is generated must be consumed or stored somewhere, and if it is not, the generator builds up a voltage that eventually burns out the windings. Then there is nothing to do but to send the instrument to the factory for rewinding, for it is absolutely

useless unless the windings are in proper order.

When it is necessary to remove the battery for outside charging or for repair, another battery should be substituted if you intend to use the car in the meantime. If this is not possible, then the only thing to do if you have to drive the car is to disconnect the generator from its drive shaft. Usually this is not a very big job, as some form of coupling is employed, and these are designed with the idea of easy removal of the generator in view.

Be sure, when putting the battery back in place that the right wire goes to the positive battery terminal and to the negative. It is best to tag each wire when you take it off, so that there will be no possibility of a mistake in replacing them. Reversal of the wires will result in very serious damage to the system.

The Ammeter a Telltale

The ammeter is a very efficient little telltale of leakage of current in the electric system. When the engine is not running, its hand should point at zero, providing none of the lamps are burning. If it does not, but indicates current being used, there is a possibility that it is out of calibration or that there is current going to waste. It is easy to determine whether the instrument is not calibrated so as to be at zero when no current is being put into the battery or withdrawn from it. Disconnect one of the battery wires. If the hand then goes back to zero you are sure current is leaking, but if the hand still remains away from zero the ammeter is not calibrated properly. This will do no harm to the system, but the inaccuracy must be taken into account in reading the instrument.

If there is current leakage, it must be located at once, for otherwise your battery will be depleted. Disconnect one of the battery wires so that no more can be wasted and then go entirely over the system to find the trouble.

If for any reason you have to disconnect the wires from the generator be sure to put the positive wire back on the right terminal and the negative on the negative terminal. If you attach them incorrectly, the ammeter will immediately swing to the full discharge position, and very soon the short circuit will empty the battery.

L. R. SCAFE RESIGNS FROM SAXON

Detroit, Mich., April 1—L. R. Scafe, who was secretary-treasurer of the Saxon Motor Car Corp., has resigned. He was formerly a member of the accounting department of the Timken-Detroit Axle Co., then joined the Security Trust Co., and the treasury department of the Chalmers Motor Co., before coming to the Saxon organization.

C. G. SELDON WITH SCRIPPS-BOOTH

Detroit, Mich., April 1—C. G. Seldon, formerly superintendent of one of the Studebaker plants, is now assistant general manager of the Scripps-Booth Co.

Dealer Liable to Owner

Quebec Court Holds Agent Responsible for Defect Causing Death

Sold Motor Car With Unsafe Wheel, Under Guarantee

MONTREAL, Que., April 1—According to a judgment rendered in the court of review yesterday by Justices Fortin, Guerin, and Archer, the vendor of a motor car, when he is acting as agent for the manufacturers, is bound to assure himself that the machine is well constructed and in perfect order, according to the guarantee, as he may be held responsible under the law for any damages which result from defects in the machine.

In the case under review it was proved that a defective wheel in the motor car which formed the basis of the action, caused the death of the purchaser, J. Philippe Pothier. His widow sued P. A. D. Robert, from whom her husband bought the car, for damages, and Mr. Justice Hutchison, in the superior court at Sherbrooke, awarded her \$2,500 on this stated ground:

"That the proof establishes beyond a doubt that the accident was due to the rotten condition of some of the spokes of the left hind wheel of the said car, which collapsed or smashed and broke away from the hub of the wheel, and which caused the car to overturn." Robert appealed from this judgment, but yesterday it was unanimously confirmed by the court of review.

Justice Guerin said:

"Were I a judge sitting with the powers of a police magistrate, and application were made to me for a warrant for the arrest of the manufacturer who put such rotten wood in the wheel of this motor car, charging him with manslaughter, I would sign the warrant. In selling such a motor car he was selling a machine in a condition that endangered life. So far as the manufacturer is concerned it was criminal. So far as the vendor is concerned, it was not a crime, but it was a fault for which he is liable for damages."

JORDAN LOCATES IN CLEVELAND

Cleveland, O., March 3—A plant will be erected in this city for the Jordan Motor Car Co. A five-acre site has been purchased on East 152d street, south of St. Clair avenue.

VERDICT SET ASIDE

Detroit, Mich., March 31—Today the supreme court of Michigan reversed the decision of the Wayne county circuit court, which, in January, 1915, awarded \$20,000 damages to W. A. Paul, who claimed he was the inventor of a curtain

holder for inside curtains on motor cars. The decision was against J. N. Collins, J. A. Bennett and the Novelty Leather Works, all of Jackson, Mich., and referred to patent No. 1,066,448, which had been filed by Collins July 22, 1912, and granted July 1, 1913.

The attorneys for Collins, Bennett and the Novelty Leather Works appealed the case, claiming that the circuit court had no jurisdiction in the matter and that the case should have been heard in the federal courts. It is said that this contention has been sustained by the supreme court.

The Novelty Leather Works is the maker of the Collins curtain.

BOCK BEARING TO BE REORGANIZED

Toledo, Ohio, April 1—Incorporation of the Bock Taper Roller Bearing Co., this week, is the beginning of the reorganization of the Bock Bearing Co., West Toledo. The initial capital stock is \$10,000, but this is preliminary to increasing the capital stock of the present company. C. E. B. Lamson, J. E. Dunipace and C. H. Clements are the principal incorporators.

KNIGHT SHUTS TEMPORARILY

Canton, Ohio, March 30—The Knight Tire & Rubber Co. has announced that it will be compelled to shut down, owing to the failure to obtain rubber from New York because of the freight congestion. About 125 cars are tied up in the east.

BIG RUSSIAN ORDER

New York City, March 31—That the market for American-made cars in foreign countries was never better is shown in reports of orders now on hand by the large exporting houses in this city. One house, Gaston, Williams & Wigmore, alone has on its books orders for \$3,000,000 worth of touring cars and trucks from dealers and merchants in Russia. None of this business is with the Russian government, but represents the foreign demand for American cars by the rank and file of motor users in Russia.

WILLYS-OVERLAND TREBLES OUTPUT

Toledo, O., April 3—A quarterly report of the Willys-Overland Co. shows that all previous production records had been broken at the close of business, March 31. This three months' statement shows a total of 47,465 cars manufactured and shipped. The month of March leads with a total of 19,780 cars. Compared with the March, 1915, production of 7,005 cars, this is a gain of 12,775 cars in that month.

The number of cars shipped in the three months' period, January 1st to March 31st, comes within a thousand cars of equaling the entire yearly production of 1914.

In twelve months' time, with increased manufacturing facilities, production figures are nearly trebled, a manufacturing and marketing achievement that has yet to be equaled in any industry.

What the Insurance Policy on Your Car Means to You

Several Classes of Risks and What They Are Especially Designed to Cover

RATING motor car risks has yet to reach the standard of perfection that is found in fire insurance. Much criticism is heard of the present basis for rate making on motor vehicles, but there has not been sufficient pressure brought to bear in the right place to bring about any great changes in the system used. Last week we took up certain forms of insurance rate-making and now we will continue to delve into this subject that all may be informed as to just how the premium on the different classes of insurance is decided.

For finding a premium on a risk where the rate is to be based on the payroll, the following type of table is used, explanation of which is unnecessary.

FORM G
Payroll Basis

Gasoline or Steam	Rate per \$100 of payroll for first \$10,000	Rate on each \$100 of \$10,000 up to and inc. \$25,000	Rate on each \$100 of payroll in excess of \$25,000 up to and inc. \$40,000
Pub. Liab. only			
Outside* exposure..	\$2.40	\$1.80	\$1.50
Inside exposure....	.60	.45	.38
Total exposure..	\$3.00	\$2.25	\$1.88
Property damage...	1.28	.96	.80

*1—Meaning outside the building.

By the term "payroll," it should be stated, is meant the total payroll, including wage-workers, salesmen, managers, office force and proprietors, although some of these are figured on a nominal basis. The usual rule regarding liability limits applies.

In addition to the above methods specific rates are made on particular risks, primarily of the factory class, by the companies.

Property Damage Risks

A. Private Passenger Cars—The method of arriving at rates for property damage insurance on such vehicles differs in only one respect from the method employed in connection with liability risks, which was to ascertain the horsepower and then the equivalent liability rate. After having employed the company's list, Form A, to ascertain the horsepower of the car in insuring against liability for property damage insurance the column headed "Property Damage" on the rate sheet, Form B, must be used to find the premium.

Thus, on a 49 horsepower car the premium for property damage would be \$18, which is the basis rate. For this sum the owner is insured against loss on account of damage done to the property of others up to a limit of \$1,000. If a greater coverage is desired an additional premium

Editor's Note—This is the third and final installment of a series of three articles on motor car insurance, which has been prepared especially for Motor Age by Robert Riegel, Instructor in Insurance, University of Pennsylvania.

By Robert Riegel

must be paid. Thus one company charges, for each additional \$100 of protection, 4 per cent of the basis rate.

B. Public Cars—The method of ascertaining rates is similar to that for finding liability rates, except that the property damage column of the rate sheet is used; see Form D. If a limit exceeding \$1,000 is desired the rate will be increased, one company charging 2½ per cent of the basis rate extra for each additional \$100 protection.

C. Commercial Vehicles—The same method is followed for ascertaining property

damage rates as for liability rates, namely, dividing the cars into classes according to the business in which used; see Form E. Two and one-half per cent of the basis rate extra is usually charged for each \$100 of insurance above \$1,000.

D. Manufacturers' and Dealers' cars—The method is similar to that used for liability rates; see Forms F and G.

Collision Risks

Two types of protection are issued against the damage caused by the collision of the insured car with other objects. One fully reimburses the policyholder for the loss he suffers, while the second pays him \$25 less than the resultant damage. The former type, known as full coverage, obviously does not provide the restriction upon reckless driving furnished by the latter or \$25 deductible coverage form, which penalizes the insured for every accident. Full coverage is, therefore, correspondingly expensive.

The rates for liability and property dam-

How Insurance on Private Cars, Public Conveyances, and Motor Trucks Vary

age risks, as we have seen, are based on horsepower, usage, and number of cars. The theory governing collision rates, however, generally is that the more expensive the car the greater the damage from collision is like to be. Thus a scraping of the side of a cheap machine of poor finish would be negligible while the value of a highly finished car would be considerably diminished. Accordingly the rates for collision insurance are based on the list price of the car.

B. Public Cars—For collision insurance on public livery vehicles the companies usually charge the private passenger car premiums plus 20 per cent additional. On public vehicles, not included in the livery class, the two types of collision coverage are charged for as follows: The \$25 deductible coverage clause requires the payment of 4 per cent of the manufacturer's catalog list price, see Form A, plus \$30 per car. The minimum price for which such insurance can be obtained is \$30 per car, however. The full coverage clause costs \$35 more than the \$25 deductible coverage form.

C. Commercial Cars—For the \$25 deductible coverage form the charge is 2½ per cent of the manufacturer's catalog list price plus full cost of equipment, with a minimum charge of \$30 per car. For the full coverage insurance one pays \$35 more than for this restricted form.

D. Manufacturers' and Dealers' Cars—All demonstrating cars are charged for on the same basis as commercial cars.

A. Private Passenger Cars—To facilitate, rating classes are established on the basis of the list prices and these groups are designated by letters. Thus cars of a value less than \$1,350 are included in class A, those valued between \$1,350 and \$1,600 are in class B, etc. In order to determine the class in which a car belongs reference is made to the eighth column, headed "Collision Clause," in the company's list of cars; see Form A. The class being discovered, a glance at the following form of collision rate schedule shows the premium:

The rating of motor car risks has not yet reached the standard of the fire insurance rating system, in spite of the

FORM H

Private Passenger Cars—Collision Premiums			
\$25.00 Deductible Coverage		Full Coverage	
Prem. Class	Ann. Prem.	Prem. Class	Ann. Prem.
A	\$28.00	A	\$63.00
B	32.00	B	67.00
C	36.00	C	71.00
etc.	up to \$200	etc.	up to \$235.00

Any car not classified must be referred to the company for special rating.

criticism the latter often receives, and objections to the methods employed in the former constantly are advanced. The chief difficulty seems to be the inability of practice to keep pace with theory, despite the best intentions of the underwriters. Motor car insurance rates are based on certain rough classifications, the refinement and modification of which is hindered by practical considerations. Thus we have seen that liability and property damage insurance rates for private, public, commercial and dealers' cars are computed on the basis of horsepower in the first two instances; business usage and number of cars in the latter two cases. The premium for collision insurance, on the other hand, is dependent upon the list price of the car. For liability and property damage insurance we have a power classification, for collision insurance a value classification.

Criticism of Rating Basis

Criticisms of the horsepower basis of rating are not lacking. The potential power of a car is no index of the probability of injuring persons or property, it is contended, because a restriction upon this power always exists. Almost any car other than a sightseeing one, hotel bus or truck can attain a speed of 30 miles an hour and more than this is almost universally prohibited by law. Such restriction of speed, it is argued, places all cars on an equal basis. This argument, while of some force, is not altogether conclusive because the mere existence of a law regulating speed is no guarantee of its enforcement. In addition, however, is the contention that the higher-priced cars, which are usually of great horsepower, are generally better driven than the cheaper machines; for instance, because of the employment of experienced chauffeurs. The distance the car is run is also offered as a consideration. In brief it is contended that the rates should be based upon horsepower, degree of skill of the driver, and mileage covered.

The present system of territorial grouping of rates also is criticized as resulting in injustice as between owners. For instance, in 1914 the rate for public liability insurance on a 49-horsepower car in Greater New York territory was \$92.50 as compared with \$69.50 for the balance of New York State and northern New Jersey and \$52.50 in Connecticut. Thus an owner in Hoboken, N. J., or White Plains, N. Y., would pay \$69.50 whereas an owner in Rye or Portchester, N. Y., would have to pay \$92.50 for the same risk and a person living 4 miles further out, say in Greenwich, Conn., paid only \$52.50. The inference from the rates would be that a car owned and operated from Portchester is 33 per cent more hazardous than one owned and operated from White Plains or Tarrytown and 76 per cent more hazardous than Greenwich, Conn.

As regards collision rates, which are

based on list prices, it is alleged that the better and more expensive car usually is better driven and has less hard usage. It has been suggested that the companies keep a record of drivers, that accidents be reported to a central bureau and that the experience and past record of the driver be taken into account in fixing the rate. It is doubtful if such a method would be worth its expense. The information necessarily would be more or less incomplete. Secondly, some men are better risks before they have been on the road a week than others who have been motoring for years. Thirdly, the average policy covers not only driving by the owner himself as well as a chauffeur, but also by every possible member of the assured's family, relatives and even friends.

In reply to the above contentions it is said by underwriters that:

"It is admitted that the present system is defective in theory but this is because of practical difficulties.

"It is impossible to devise a system for rating drivers, since the insurance may be taken by one party and the machine driven by another.

"The difficulty and negligence in speed law enforcement makes horsepower still a factor in ratemaking.

"With respect to any zone system of rates those just outside the various more favored limits will always complain.

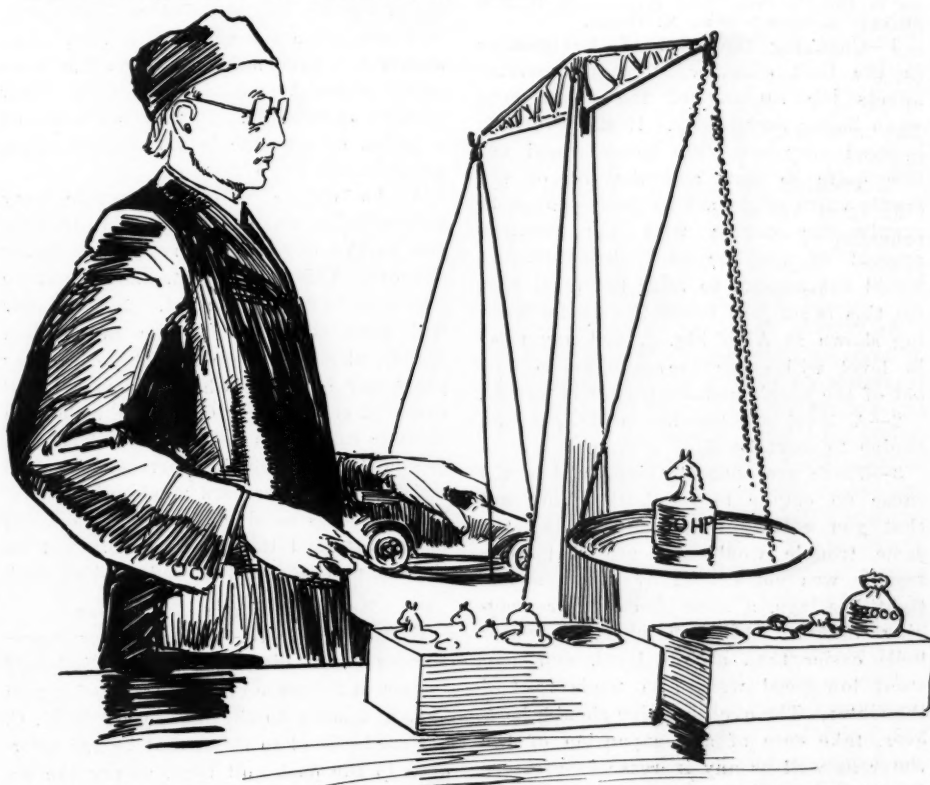
"There are many factors which underwriters would be glad to consider such as make of car, mileage run, moral hazard, etc., but find it impossible systematically to rate."

Until some person comes forward with

some constructive rather than critical ideas, therefore, little improvement can be expected in the rating system. Exactness of premium computation in all branches of insurance has been developed only by experience. There was a period in fire insurance when the only classification of risks was ordinary, hazardous and doubly hazardous—the same sort of rough grouping which we have today of motor car risks; indeed the motor car system has a much better basis. A more scientific method later will evolve from the somewhat crude approximation now employed.

The present method, however, as has been indicated, is not a purely arbitrary one as might thoughtlessly be supposed, but is founded upon certain apparently fundamental considerations. If other factors equally fundamental have not been given due weight this is because of the practical difficulty of establishing a method of measurement.

The object of the present article, however, is not criticism but exposition. It is believed that the surest method of extending the scope of any insurance business is to educate the public regarding its general principles and methods. On the other hand only by a consideration of some of the fundamental problems of ratemaking can an owner become an intelligent purchaser of insurance and a satisfied policyholder. The most important bases of automobile rates have therefore been described in order that their appreciation by the policyholder may cause the insurance policy to more fully realize the object of all contracts—a meeting of the minds.



Criticisms of the horsepower basis of rating are not lacking. The potential power of a car is no index of the probability of injuring persons or property. The factors governing rate-making would require an apothecary to determine the real prescription.

The Readers' Clearing House

Reasons for Water Boiling in Mountainous Districts

High Altitudes Affect Motor and Overheating May Be Result

DENVER, Colo.—Editor Motor Age—I have a 1914 Ford car equipped with a Stromberg model G carburetor. Although I get better than 22½ miles to a gallon of gasoline, I would like to know whether a lower level would add to the economy.

2—Would a lower level make the car start harder? This is an important item as I have a Boston self-starter which only throws the engine over compression.

3—At first I had much trouble on account of the engine overheating. The Ford company changed the radiator head to the 1915 type, which gave more volume for the water, but no better results.

I made a trip from Denver to San Francisco and Los Angeles and return last fall which required mile after mile of low-speed work in the chuck hole districts and up grades.

The water boiled so furiously that the overflow pipe would not carry off the steam and water fast enough, causing enough pressure to be formed in the radiator to bulge it and cause a leak. I saw many other cars having the same trouble.

At Salt Lake I had the radiator soldered and I also had a "steam dome" put on which consisted of simply a 4-inch extension soldered on the top. See Fig. 1. I had the overflow pipe raised correspondingly, and also had a pet cock screwed into the filling cap.

On the return trip the car did not overheat appreciably and I have had comparatively little trouble since.

I observed that this difficulty is general in this part of the country, and think this device would be of service to cars used in mountainous regions.

I am naturally curious to know what was the cause of both the excessive boiling and sudden stopping of same.

4—Does a carburetor work as economically on medium or very low throttle as it does on open throttle?—Wm. M. Welsh.

1—Changing the level of the gasoline in the float chamber of the carburetor affects the running of the motor only when idling very slowly. If the level was lowered very much the motor would not idle quite so slow and the lift of the needle valve might not be great enough to supply the engine with the required amount of gasoline at high speed. It would not be safe to raise the level any, for this is set just below the nozzle opening shown at A in Fig. 2, and any raise in level will cause the gasoline to flow out of the nozzle and flood, as it is termed.

2—A level set too low will cause an engine to start hard.

3—There are several things which will cause an engine to overheat. The fact that you noticed other cars having the same trouble would indicate that your trouble was not caused by a late spark, tight bearings, a loose fan belt or dragging brakes. At high altitudes water boils easier than at sea level, and constant low-speed work also tends to boil the water. The overflow pipe should, however, take care of any expansion of the water as well as any increase in pressure due to steam being generated. It is probable in your case that the overflow pipe is stopped up. The steam dome would take

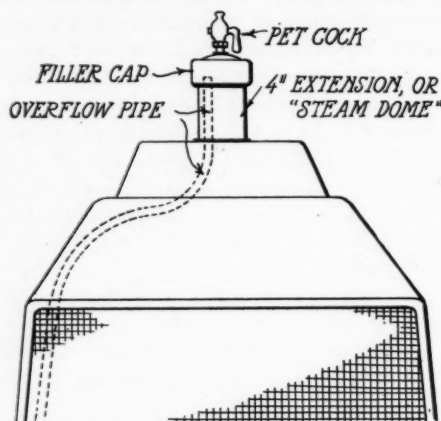


Fig. 1—How to keep radiator from boiling over

care of the expansion of the water, and the petcock would relieve the pressure due to the steam. A motor which is required to do much continuous hard pulling should be given a slightly richer mixture on the high-speed adjustment to avoid overheating. It would be judged from the mileage that you are getting that your carburetor is adjusted on the lean side if anything, which would cause overheating on hard pulls. We would advise that you screw the high-speed adjustment nut shown in the sketch at B about one complete turn up, or counter-clockwise. The high-speed spring should have a little play, however, when the motor is at rest. This should not have much effect on the economy, although much depends on your present adjustment. Twenty-two miles on a gallon of gasoline is not a phenomenal performance for a Ford car.

4—An engine will not operate very economically on extremely low throttle due to the fact that it requires a richer mixture. This is inherent, and cannot be overcome in the carburetor. A carburetor will give the best mileage at medium speeds, although there should not be any particular speed at which the motor will run most economical. Of course, wide open throttle running is not economical because the motor is overcoming increased internal resistance and increased wind resistance if high speed is attained, and if high speed is not attained it is due to work put on the engine because of a grade or bad road.

Reader Makes a Suggestion

Kansas City, Mo.—Editor Motor Age—I note your diagram of the Splitdorf system in the issue of Motor Age of March 2nd, in answer to the inquiry of A. M. C.

I am inclined to think that he has reference to the dash coil type, as per the accompanying diagram, Fig. 2A. The current from the battery passes down to the switch contact B, through the switch blade

Point at Which Water Boils Is Much Lower Than at the Sea Level

and to the contact C, from there through the push button to point N. From this it passes through the primary to the ground back through the breaker into the switch point A. A small insulated plate X connects to the bar R and back to the battery.—W. G. Kliffer.

FOR AND AGAINST LONG STROKE Reason Given Why This Type of Motor Is Better—Also Disadvantageous

Darien, Wis.—Editor Motor Age—Please bring out why the bore and stroke of a motor makes a difference. For instance, if a motor has a long stroke and small bore and another motor has a short stroke and large bore and they both have the same cubic inch displacement, what would cause the difference in power, or is there any difference?—J. B. Johnson, Jr.

The problem as to which stroke-bore ratio is best seems to be insolvable at present, as engineers disagree greatly on this point. Some prefer the short stroke, others adhere to the square motor, while the majority are believers in the long stroke. In a recent article E. P. Batzell, M. E., set forth the advantages and disadvantages of the long-stroke motor as follows: The advantages resulting from a careful study of the subject are: 1, smaller mechanical losses and less wear in the motor bearings; 2, better thermal efficiency in the medium-long-stroke type as caused by the decrease of heat losses from the cylinder and better mixing of the fresh charge at its entrance into the cylinder; 3, higher range of maximum obtainable piston speed; 4, more favorable type for high compression work; 5, better for the use of poor grades of fuel; 6, smaller loss of pressure in the cylinders due to less gas leakage around the pistons; 7, less harmful influence on the performance of the motor, because of expansion and distortion due to piston and cylinder heating; 8, accessibility of the valve mechanisms due to greater space permissible for these parts; 9, better low-speed performance; 10, somewhat lower temperature and pressure of the exhaust."

The disadvantages as set forth are: "1, motor accelerates with more vibration unless extra light moving parts are used; 2, larger timing gears necessary due to the distance between the camshaft and crankshaft to provide for connecting rod clearance. Larger timing gears, call for more noise, a higher peripheral velocity and added cost; 3, heavier valve mechanism parts resulting in noisier valve action; 4, less adaptable to four-cylinder motors

using two-bearing crankshafts and sixes using three bearings.

These advantages and disadvantages take for granted that the long and short-stroke motors discussed have the same construction otherwise. The advantages of the long-stroke may be considered as disadvantages of the short-stroke and vice versa.

TIMING OF A WISCONSIN MOTOR

How to Replace Shafts and Gears to Give Correct Setting

Chicago—Editor Motor Age—I would appreciate it if you would tell me how to time the models M and P Wisconsin motors?

2—Please advise how to replace new shaft and gears so that they are timed correctly.—Subscriber.

1—The time of the model M Wisconsin motor is as follows: Inlet valve opens 15 degrees after center, closes 45 degrees after lower center. Exhaust opens 45 degrees before center, closes 10 degrees after upper center.

On the type P motor: Inlet opens 15 degrees after upper center, closes 30 degrees after lower center. Exhaust opens 45 degrees before lower center, closes 10 degrees after upper center.

2—The timing gears are marked to facilitate reassembling of the motor. We drive from the crankshaft gear through an idler to the inlet and exhaust camshaft gears. The idler gear is marked with three letters, G, I and E, which are to coincide with similar letters on the crankshaft. Inlet camshaft and exhaust camshaft gears respectively.

1910 CADILLAC MISSES ON MAGNETO

Difficulty Probably in the Distributer Points—They May Be Pitted

San Marcos, Tex.—Editor Motor Age—What is the accepted method of figuring horsepower? 2—What is the horsepower of a 4 by 6 four-cylinder motor?

3—I have had considerable trouble with a four-cylinder 1913 Cadillac. It runs well on the battery. On the magneto, Delco senior system, it misses at all speeds. Everything I could do to remedy the trouble has been of no avail. The induction coil has been changed, spark plugs, wiring tested, etc. Can it be in the relay? The distributor block has been changed.—J. F. O'Brien.

1—The formula by which horsepower is figured is known at present as the N. A. C. C. and is the square of the bore in inches, multiplied by the number of cylinders and this result divided by 2.5. This gives the horsepower at 1,000 feet per minute piston speed, that is, with a stroke of 6 inches the pistons travel 1 foot every revolution of the crankshaft and the pistons travel 1,000 feet every time the crankshaft turns over 1,000.

2—25.6 at 1,000 feet per minute piston speed or 1,000 r.p.m.

3—Since you get a good spark on the battery side it is very likely the fault lies in the magneto side of the distributor points. These probably are pitted and until you have repaired or replaced them you will continue to have trouble. Examine the points of your distributor. If there is enough platinum left they may be cleaned by filing, but if they are worn

down to the brass, they must be replaced with new ones. Then again they may be

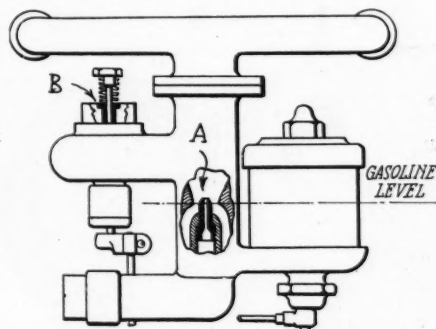


Fig. 2—Illustrating fuel level and how changes may be made

set wrong. It is hardly likely the fault is in the relay. Get the distributor points right first, then if the trouble continues look to your relay.

Keeper on Magneto

Aneta, N. D.—Editor Motor Age—Would it be of any advantage to arrange a V-shape piece of iron over the poles of a magneto, to act as a keeper on a magneto which stands idle for long periods, such as on a gas tractor? Frank Olson.

No, the magneto base itself is the keeper.

Putting New Gears on Franklin

Dallas, Tex.—Editor Motor Age—Have been a reader of your paper for several years and find it an indispensable help to me. I would appreciate it if you would give me the following information:

1—I have a 1910 model Franklin, five-passenger touring car; the gears that drive the magneto, camshaft and oiler are located in the rear of engine, just in front of flywheel are worn and noisy. I am going to order new ones and would like to know if I can't put new gears on without taking engine out of frame. Can't I loosen universal behind transmission, take out transmission and take off flywheel from the rear of the engine. The gears are not inclosed at all. Any information will be appreciated.—Ora Boyle.

1—The Franklin company advises that the engine be removed to install the new

gears. The way you mention is not possible.

CANNOT CRANK ON THE BATTERY

Chalmers Owner Must Disconnect Negative Light Wire to Start Engine

Lawrence, Kan.—Editor Motor Age—I have a Chalmers, 1913 model 36, which is equipped with Gray & Davis lighting system and from this battery I have had connected a mechanical horn and ignition through a dual Splitdorf, which worked successfully for several months, but now it is impossible to crank on battery with the lighting wires attached, but by disconnecting the negative lighting wire, I can crank, but the minute the generator starts making current the engine stops, or by detaching both lighting wires, but with horn connected the engine runs perfectly. Have just put in new lighting switch. Can Motor Age offer a suggestion as to my trouble? —A. H. Bromelslick.

The trouble you are having with the motor being hard to start or unable to start is caused from having the lighting battery horn and ignition all hooked up on one battery. The ignition coil is not wound to stand the lighting battery or to be connected up in this manner. The lighting battery is an 80 ampere hour battery and the ignition is 40 ampere hour battery, and in hooking up the wires in this way, this owner will always have more or less coil trouble, for, as I have stated before, the coil is not heavy enough to carry this load from the generator and battery. If you wish to go into this matter more thoroughly, we suggest that you get in touch with the Splitdorf people.

Oakland Not an Assembled Car

Little Cedar, Ia.—Editor Motor Age—Is the Oakland what would be called an assembled car?

2—At 25 miles per hour, what is the horsepower and number of revolutions in the Oakland model 32?—R. S. Tyler.

1—No.

2—At 25 miles per hour the motor is turning over 1,150 revolutions per minute and is developing a brake horsepower

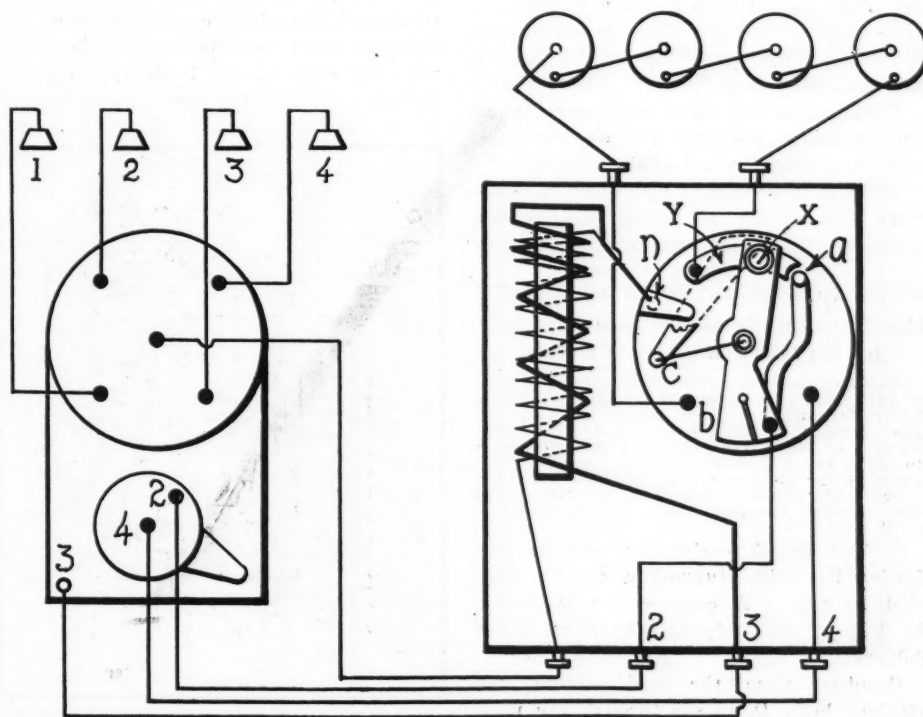


Fig. 2A—Dash coil type of Splitdorf System, suggested by a reader for the aid of another

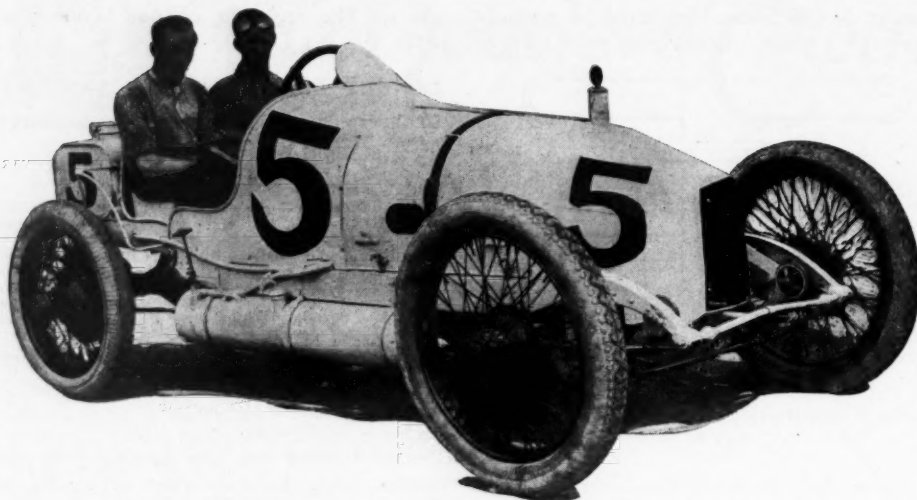


Fig. 3—The Beaver-Bullet which was asked for in an inquiry last week

test at this revolution of 25 horsepower. The gear ratio of the model 32 is $4\frac{1}{4}$ to 1.

THE BORE AND STROKE OF A BUICK Wants to Know Maximum Horsepower This Car Will Develop

Rochester, Minn.—Editor Motor Age—What is the bore and stroke and diameter of valves of 1913 and 1914 Buick four-cylinder roadster motors?

2—What power will this motor develop if steamed up to the limit? Is it possible to obtain in B.H.P. 3 or $3\frac{1}{2}$ times the A.L.A.M. rating?

3—What estimate of the maximum of the miles per hour could be obtained with the very best tuning up and would the rest of the machine stand the strain with careful driving?

4—What procedure is best for a person who is desirous of entering the racing game and affiliating with the best producers of racing machines?—W. H. Meredith.

1—In 1913 the Buick company manufactured the model 24, $3\frac{3}{4}$ -inch bore by $3\frac{3}{4}$ -inch stroke with $1\frac{1}{4}$ -inch valves; and the model 30, 4-inch bore by 4-inch stroke, with $1\frac{1}{2}$ -inch valves. In 1914 they manufactured the B24 of the same dimensions as the 24 1913, and the B36, $3\frac{3}{4}$ -inch bore by 5-inch stroke with $1\frac{1}{2}$ -inch valves.

2—Both of these models developed considerably more power than called for by the S. A. E. rating.

3—These models have never been tuned up for racing purposes and we would be unable to advise you in this respect.

4—This is a matter you must take up with the makers of racing cars or the manager of the race team of that concern.

ZENITH CARBURETER INFORMATION Has No Adjustment—Designed Especially for the Motor on Which It Is Used

Houstonia, Mo.—Editor Motor Age—I have a 1912 model H Hupmobile equipped with a Zenith carbureter. The motor smokes, the gas mixture seeming to be too rich. The amount of oil in the crankcase does not seem to make any difference. Kindly publish a diagram of the 1912 model of Zenith carbureter, showing, if possible, how the flow of gas to the mixing chamber may be regulated.—G. R. M.

1—The Zenith carbureter used on the Model H, 1912 Hupmobile was a $1\frac{1}{4}$ -vertical type. A cross-section is shown in Fig. 4 and adjustment is made as follows:

Gasoline from the tank enters the strainer body D, passes through the wire gauge DI, and enters the float chamber

through the valve seat S. As soon as the gasoline reaches a predetermined height in the float chamber, the metal float F acting through the levers B and collar G2, closes the needle valve GI, on its seat. To see if there is any gasoline in the carbureter, remove dust cap CI; if needle valve can be depressed with the finger, there is no gasoline in the carbureter.

From the float chamber to the motor, gasoline flows through three different channels in various quantities and proportions, according to the speed of the motor and to the degree of throttle opening. With the throttle fully open, most of the gasoline flows through the channel E and main jet G, some flows through compensator I, then through K to the cap jet H, which surrounds the main jet. Main jet and cap jet work together and their combination furnishes the mixture whatever by the speed of the engine. At slow speed when the throttle T is nearly closed, they give but little or no gasoline, but as there is considerable suction on the edge of the butterfly, the tube J, terminating in a hold near the edge of the butterfly, picks up gasoline, which is measured out by a small

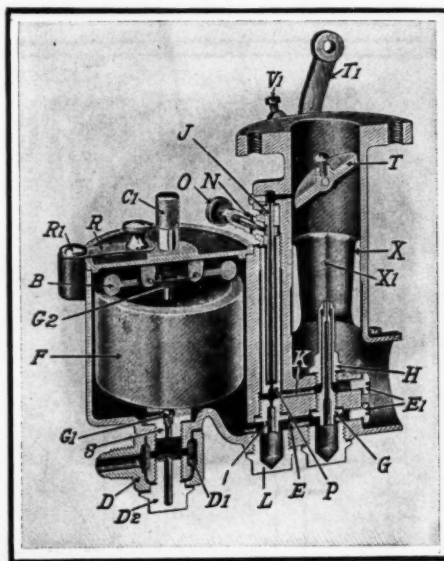


Fig. 4—Plan view of Zenith carbureter

hole at the top of the priming plug. The well over compensator I is open to the air through two holes, one of which is indicated below the priming plug on the illustration. These air openings are important.

INSTALLING THE HORN AND LIGHTS Reader Wires Car So That Both Sides of Battery Are Grounded

Stulton, Pa.—Editor Motor Age—As a subscriber and reader of your magazine, please send me or publish an illustration in Motor Age of a wiring diagram to help me out of my trouble. I have a Pullman 6-46 1915 model car equipped with a 12-volt Willard battery. Later I purchased a 6-volt searchlight. I put both on car, but neither work alone. I have to turn on the light before the horn blows or vice versa.—Lawrence B. Brandt.

The cause of your trouble with the horn and lamp is due to the fact that you have the horn switch in the line between where the lamp is connected and the battery, and also that you have both sides of the battery grounded whenever the horn switch is closed. The chances are that you have been having trouble with the battery running down more rapidly than it should simply because there has been a short circuit through the ground whenever the horn button is pressed. Figs. 6 and 7 illustrate two methods of wiring by which the difficulties would be overcome. You will notice that the horn button is in the circuit with the horn only and not with the lamp circuit. A better way than that shown in Fig. 6 is illustrated in Fig. 7 in which you are taking the current for the horn from one side of the battery, that is between terminals B and C. This will divide the drain on the cells so that you will not be working one side of the battery so much more than the other as is the case illustrated in your sketch Fig. 8 and in Fig. 6.

In case the neutral point of the battery terminal B is grounded it is suggested that the easiest way to do this rewiring is to connect at the point X to the ground so that you can leave out the neutral wire from X to B.

Wants Data on Marmon

Towanda, Kan.—Editor Motor Age—Has the Marmon 34 been tried out similar to the way the Hudson was tried out when it made 76 miles per hour. If so, what speed was obtained?

2—What are the revolutions per minute of the Marmon engine?

3—Which can stand the most endurance, a wire wheel or a wooden wheel?—W. Chain Robison.

1—If it has no official announcement has been made.

2—2,450.

3—There is some difference of opinion on this but many concede that the wire wheel is the stronger.

SIZE OF EDDIE PULLEN'S MERCER Four-Cylinder, With a Bore of 4.8 Inches and a Stroke of 6.2 Inches

Wauwatosa, Wis.—Editor Motor Age—Kindly give the dimensions of the motor used in Pullen's Mercer which won the Ascot Park race, March 5, 1916.

2—Give the different positions of gearshifting lever of the Locomobile and Cunningham.

3—Give dimensions of the motor used in the Mercer which Pullen drove at Corona in 1914.

4—What is the speed of the four and eight-

cylinder Scripps-Booth cars?—A Constant Reader.

1 and 3—The Mercer driven by Pullen March 5 is the same one he drove at Corona in 1914. It has four cylinders, the bore being 4.8 inches and the stroke 6.2 inches. The piston displacement is 445 cubic inches.

2—These are shown in Fig. 5.

4—The Scripps-Booth four has a speed of 50 miles an hour, and the eight, 60.

TIMING OF VALVES ON FORD CAR Opening of Intake Occurs $\frac{1}{8}$ Inch After Top Center

LuVerne, Ia.—Editor Motor Age—Please tell me the setting of the Ford valves and also if it is practical to have flattened crankpins on a Ford crankshaft re-turned in a lathe. Would regular size connecting rods fit it as well as on a new shaft.—Leo Natestine.

The Ford timing is as follows: Exhaust opens when the piston reaches $\frac{1}{8}$ -inch of bottom center, the distance from the top of the piston head to the top of the cylinder casting measuring 3 $\frac{3}{8}$ inches. The exhaust closes on top center, the piston being $\frac{1}{8}$ -inch above the cylinder casting. The intake valve opens $\frac{1}{8}$ -inch after top center, and closes $\frac{1}{8}$ -inch after bottom center, the distance from the top of the piston to the top of the cylinder casting measuring 3 $\frac{3}{8}$ inches. The crank pins should be re-ground—not turned down. You can use the same rods again providing you take them up enough to compensate for the slight reduction in diameter of the shaft bearings.

PRINCIPLE OF TWO-CYCLE ENGINES Each Cylinder Gets An Explosion Every Time Crankshaft Turns Over

Peru, Ill.—Editor Motor Age—On page 22 of the January 6 issue of Motor Age, it says that the new Hudson Super Six is the first motor built under the Hudson company's own roof. Does this mean that the Hudson company did not build their own motor before, and if they did not, what make of motor did they use?

2—Kindly explain the operation of a two-cycle engine? How charge is drawn in, compressed and fired.

3—Explain the working of the valves or port holes, their general location and position during the different strokes of the piston.

4—With the exhaust valve located at the head or top of a cylinder, will the engine scavenge better?—I. L. W.

1—A Continental motor was used.

2 and 3—In a two-cycle engine there is an explosion in each cylinder every revolution of the crankshaft. In usual practice, the charge is drawn through cored ports into the compression chamber, which usually is the crankcase, as the piston moves toward the top of the cylinder. At the time of the explosion and as the piston starts on its downward motion, the charge for the next explosion is put under compression. At a certain point the port into the combustion chamber is uncovered; that is, when the piston is practically all the way down. This allows the compressed charge to rush into the combustion chamber and a deflector on the head of the piston directs the charge toward the top of the cylinder, which keeps the charge from going out on the opposite side of the cylinder with the exhaust. The port through which the charge is drawn into the compression chamber runs also to a point just a little nearer the head of the

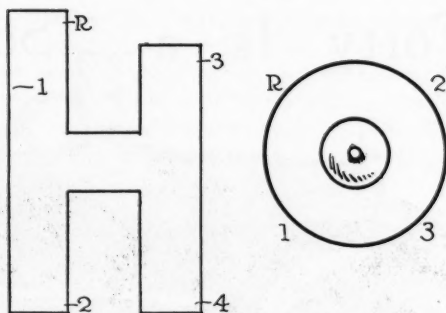


Fig. 5—Left, Locomobile gearshift positions, and right, the Cunningham

Communications Received and Inquiries Answered

W. M. Welsh.....Denver, Colo.
W. G. Kliffer.....Kansas City, Mo.
J. B. Johnson, Jr.....Darlen, Wis.
Subscriber.....Chicago
J. F. O'Brien.....San Marcos, Tex.
Frank Olsen.....Aneta, N. D.
Ora Boyle.....Dalls, Tex.
A. H. Bromelslick.....Lawrence, Kan.
R. S. Tyler.....Little Cedar, Ia.
C. E. Platte.....Chicago
W. H. Meredith.....Rochester, Minn.
G. R. M.....Houstonia, Mo.
L. B. Brandt.....Stulton, Pa.
W. R. Robison.....Towanda, Kan.
A Constant Reader.....Wauwautosa, Wis.
A. W. Sheets.....Madrid, N. Y.
I. L. W.....Peru, Ill.
J. A. Smith.....Indianapolis, Ind.
Leo Natestine.....LuVerne, Ia.

No communication not signed with the inquirer's full name and address will be answered in this department.

cylinder than that at which the piston reaches its lowest point of travel. Thus it will be seen that this port, opening into the combustion chamber is covered by the piston shortly after it starts on the upward stroke and remains so until after the explosion has forced the piston back almost to its lowest point of travel. The vacuum created in the crankcase by the upward stroke of the piston draws the

fuel into the crankcase to be compressed by the next downward stroke of the piston. The shape of the head of the piston directs the incoming charge toward the top of the cylinder and helps to scavenge the chamber.

4—This depends on the design. Usually scavenges better, but may lose fresh gas.

PECULIAR KNOCK ON ENGER CAR Probably Caused by a Pinion Shaft Bearing at Front of Propellor

Indianapolis, Ind.—Editor Motor Age—There is a peculiar knock on my 1914 four-cylinder model B Enger. It sounds like a valve tappet, but is more distinct, and ceases entirely when the clutch is disengaged. The motor has been checked up and found to be in first-class condition. Also, the car has developed a grinding noise at 15 miles per hour, but the noise disappears after the speed has increased to 18 miles. It seems to come from the rear system. Can Motor Age suggest a remedy for these troubles?

2—What is the speed of the car?—J. A. Smith.

1—The Enger company advises that the knocking and grinding noise is caused by the pinion shaft bearing. This bearing may be practically ruined, and if so it would result in just such a condition. Suggest that you look at the front and thrust bearing. This is located on the front end of the propellor shaft. If this bearing is badly worn, it would give end play on the propellor shaft, and cause it to knock.

If neither of the above prove to be the cause of the trouble, the Enger people suggest that you examine the differential for side play. If so, adjust it by taking up the adjusting nuts. Then, too, the square ends of the rear axle driveshafts may be worn badly, so that they are very loose in the differential gears, which would cause the knocking.

2—Properly adjusted, the car should develop from 4 to 60 miles on direct drive.

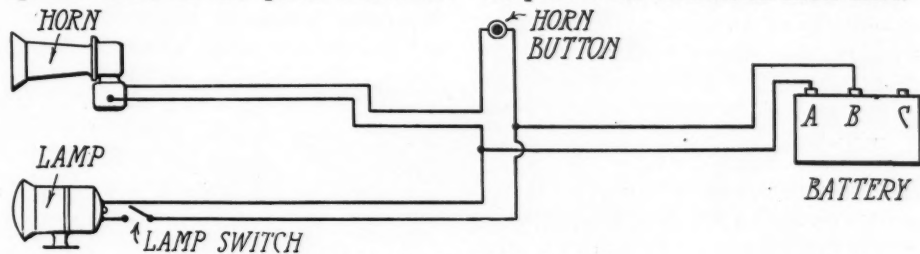


Fig. 6—A suggested wiring for horn

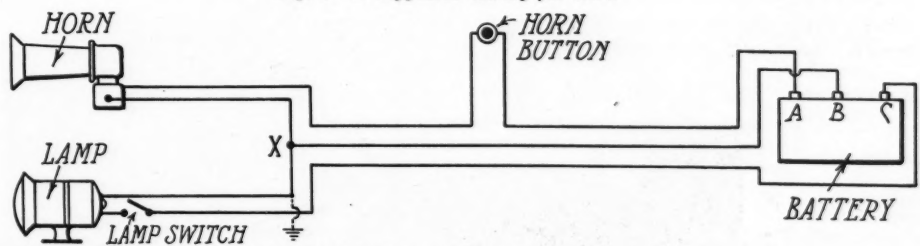


Fig. 7—A better method than Fig. 6

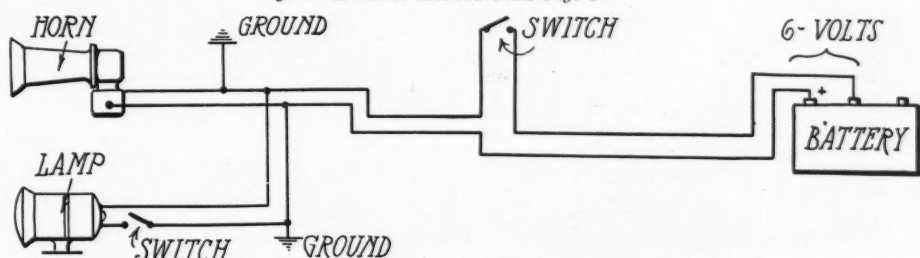


Fig. 8—Way reader had horn connected

Anderson Six Forty Is a Southern Built Car

Two Models, Roadster and Touring, Being Turned Out at Present

Price is \$1250, and Equipment Is Complete



At the right, above, is a side view of the car with top down, showing sixth seat, which folds and can be removed by lifting out. Just above is a side view of the car, illustrating the complete mudguards in front, as well as splash guards, Moto-Meter, searchlight and lines of the car, while at the right is a front view of the chassis

THE Anderson 6-40, made by the Anderson Motor Car Co., Rock Hill, S. C., has the distinction of being the only car built in the South, and by building in the South is meant the construction of the body, all upholstering, painting, finishing, trimming, etc. The company, being controlled by the Rock Hill Buggy Co., utilizes that plant for the construction of its cars. The Anderson six has been in course of construction and through an experimental stage covering almost 2 years, and the result is a light six selling in roadster and touring body styles at \$1,250, f. o. b., Rock Hill, N. C.

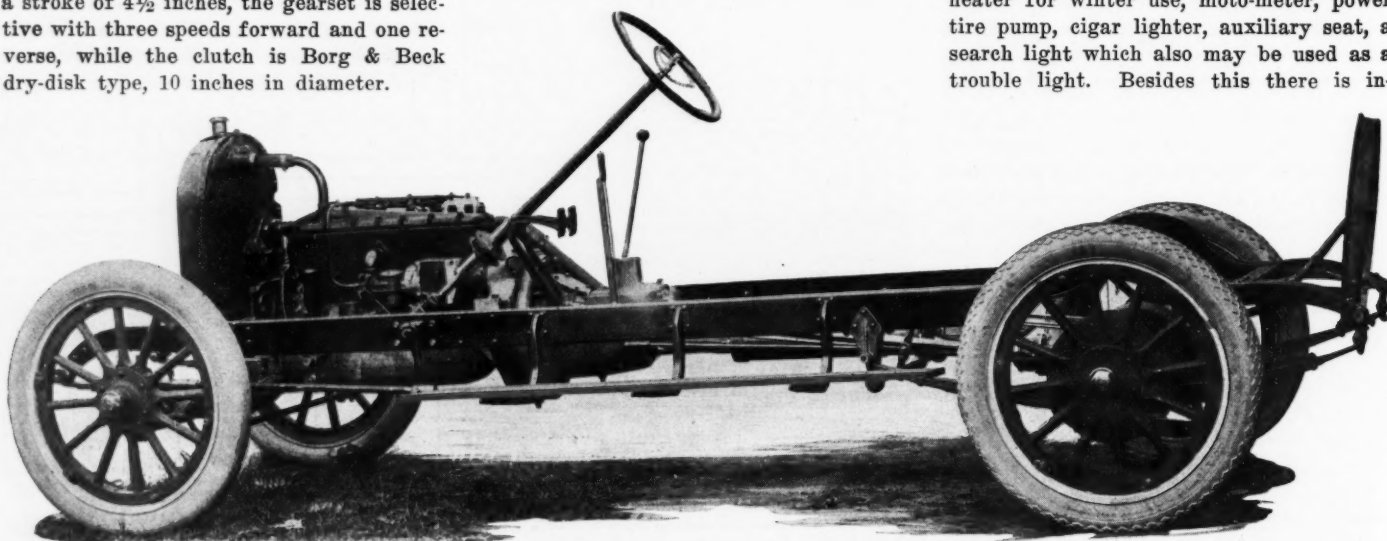
The powerplant consists of a block-cast, Continental, high-speed motor of the L-head type, having a bore of $3\frac{1}{4}$ inches and a stroke of $4\frac{1}{2}$ inches, the gearset is selective with three speeds forward and one reverse, while the clutch is Borg & Beck dry-disk type, 10 inches in diameter.

The electrical equipment consists of the Westinghouse two-unit starting and lighting system with automatic ignition advance. Included with this system is an ammeter, dimmer switch, 80-ampere-hour battery, and a motor-driven electric horn. The carburetor is a Zenith. Hotchkiss drive is used. The front axle is an Anderson-Mott, reversed Elliott type, and the rear an Anderson-Mott floating. Internal expanding brakes, 14 inches in diameter, are used with a special system for equalization. The frame is narrowed in front to give a shorter turning radius. While the wheelbase is 120 inches, the total length of the frame is 162 inches.

Semi-elliptic springs are found both in the front and rear of the Anderson six,

the springs having phosphor bronze bushings in the eyes for bolts. The front spring measures 2 by 36 inches and has a 5-inch play, while the rear is 2 by 56 inches, underslung, with an 8-inch play. The body design follows the conventional streamline type, the door hinges are concealed and the upholstery is of leather. The bifurcated front seats give an ample passageway from the driver's compartment to the rear.

The Anderson six, touring, is finished in dark brewster green for the body and wheels and the axles, fenders, hood and other metal parts are finished in black. The roadster body in Khaki with dark brown fenders. Special color schemes may be had to order. Unusually complete equipment is found in this car, this including a heater for winter use, moto-meter, power tire pump, cigar lighter, auxiliary seat, a search light which also may be used as a trouble light. Besides this there is in-



The left side view of the chassis, showing the six-cylinder Continental motor and the Westinghouse starting motor

cluded demountable rims, one man top, Crown fenders with splash guards, ventilating windshield, speedometer, hand pump, and repair kit. The tires are 33 by 4. The window is the back of the touring car top has the letter "A" in it as a distinguishing mark.

FRENCH MOTOR CAR MAN KILLED

Paris, March 15—George Richard, head of the Unie Automobile Company, Paris, has lost his eldest son, Raymond, as the result of an aeroplane accident while on active service in the French army. Young Richard held the rank of sergeant-aviator. While flying along the French front his machine broke in the air and came down from a height of 1,000 feet, both pilot and observer being killed. Before the war Raymond Richard was attached to his father's factory at Puteaux, near Paris.

STROMBERG COMPANY FILES NEW SUIT

Chicago, April 1—A new development in the litigation between the Stromberg Motor Devices Co. and the Zenith Carburetor Co., involving the patent rights which the Stromberg company asserts are infringed in the Zenith carburetor, came with the filing of a suit last week by the Stromberg company in the United States district court at Chicago. The earlier litigation, in which the Stromberg company sought and obtained a temporary restraining order, following which the case was carried to the United States court of appeals, where it is now pending, involves the earlier patents on the carburetor, which again is the article in dispute. The new suit is based on the claim that the auxiliary reservoir with restricted or adjustable feed is a feature covered in the recent patents of the Stromberg company and that these patents are infringed in the new models of Zenith carburetors.

NEW MONTANA TOWN NEEDS GARAGE

Livingston, Mont., March 25—In southern Montana, near the Arch entrance to Yellowstone national park, on the Yellowstone Trail, the new town of Wonderland City has been started through the efforts of the Todd Photo & Film Co., which will establish moving picture studios there, and among the opportunities for those seeking business locations, according to representatives of the film company, is the chance to open a garage and gas station.

Motor cars were allowed in Yellowstone park last year for the first time. The moving picture company expects tourist travel all year and invites some garage man to take advantage of the travel which will pass through Wonderland City. The town is located a few miles from Gardiner, Mont., where motorists entering and leaving the park would find it convenient to stop for repairs and gasoline. Last season several cars got stalled in the park because no filling station had been provided and gasoline was not available. The nearest garage is at Gardiner.

Besides the moving picture studios, which are to cover 50 acres, a hotel, an amusement park, an Indian village and several business enterprises are promised, and several lodges and summer homes will be built. Winter carnivals will be held at Wonderland City.

ATTACKS VACUUM FEED PATENTS

Chicago, April 1—A complaint has been filed in the United States district court at Chicago charging that the Stewart-Warner Speedometer Corp., in manufacturing the Stewart vacuum gasoline system of carburetor feed, is guilty of an infringement of patents controlled by William G.

Thomas and Arthur L. Payton upon a vacuum feed carburetor that embodies a device covered by separate patents, this being a suction type of reservoir operated by the suction of the carburetor.

The latter feature, upon which James B. Seager, of the Emergency Forge, Chicago, holds a patent, No. 984,032, issued February 14, 1911, and also N. T. Harrington, holding patent No. 983,994 issued on the same date, is the part in which it is asserted infringement has occurred. Officials of the Stewart-Warner company have been served with summons, but have not been informed of the nature of the claims against them and are withholding any statement for the present.

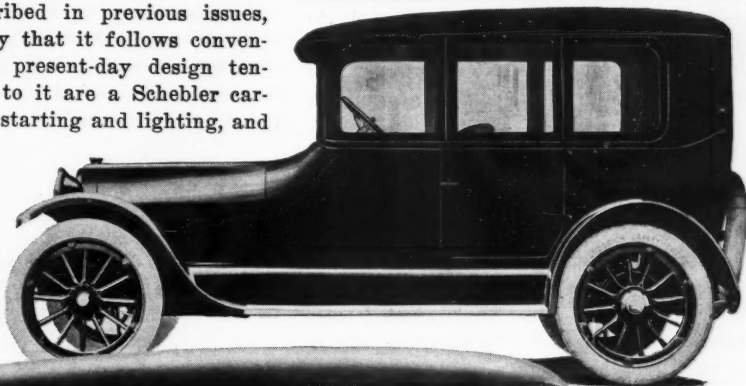
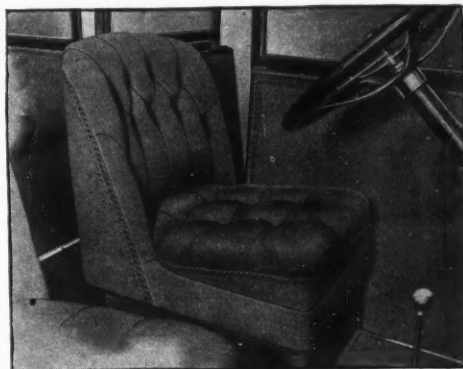
Studebaker Announces Convertible Sedan

New Body Mounted on the Regular Six Chassis

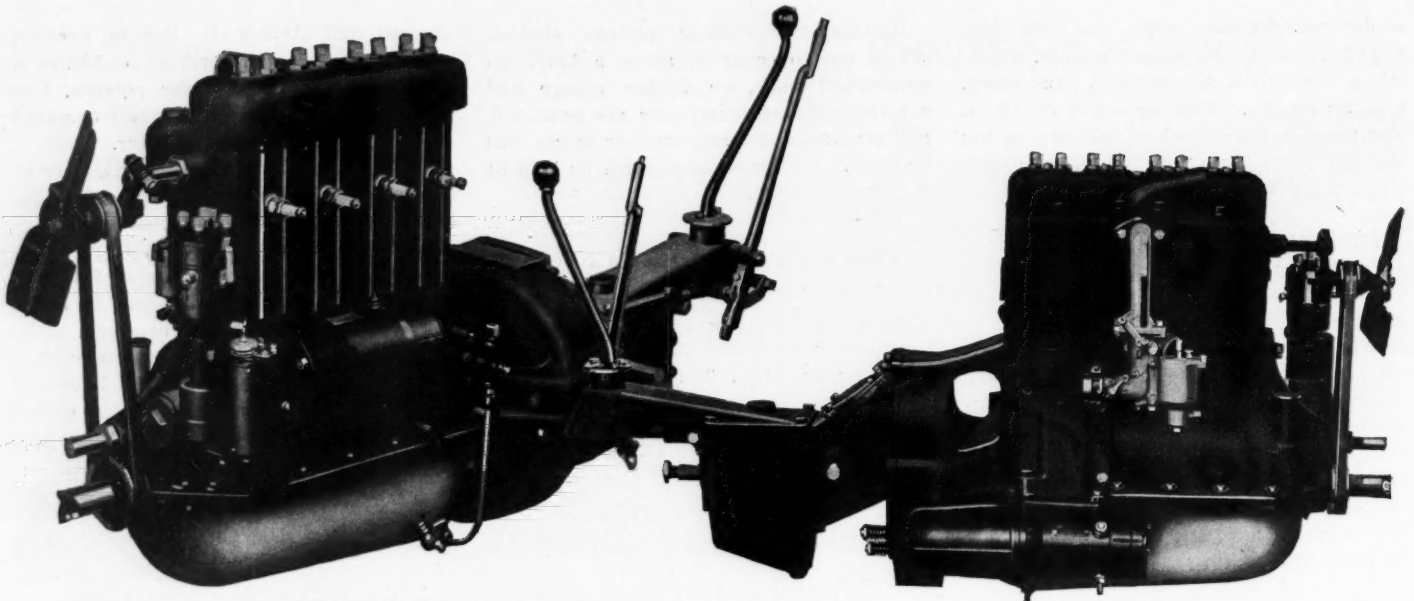
—Price, \$1,675

TO meet the increasing demand for a semi-convertible type of car that can be used to advantage the year around, Studebaker has added a sedan model to be fitted to the standard six-cylinder chassis. The price set on the newcomer in the Studebaker line is \$1,675, and deliveries have just begun. The top, though permanent, is of the type in which the side glass panels can be folded down to make almost an open car.

The Studebaker six chassis, to which this body is fitted, is powered with a 3 $\frac{7}{8}$ by 5 motor of the block-cast type. It has been fully described in previous issues, but suffice to say that it follows conventional lines and present-day design tendencies. Fitted to it are a Schebler carburetor, Wagner starting and lighting, and Remy battery ignition from a Willard storage battery. The gearset is in unit with the rear axle. Tires are 34 by 4.



Top—View of the driver's seat showing depth of cushions and leg room afforded. Middle—An outer view of the new Studebaker sedan. Left—View of the rear compartment at close range.



Left side of new Scripps-Booth four which has outside adjustment of valves. This shows attachment of generator and ignition

Right side of the four-cylinder Scripps-Booth motor, which has bore of 3 inches and a stroke of $4\frac{1}{2}$. Starting motor mounting is shown

Details of the 1916 Scripps-Booth Four and Eight

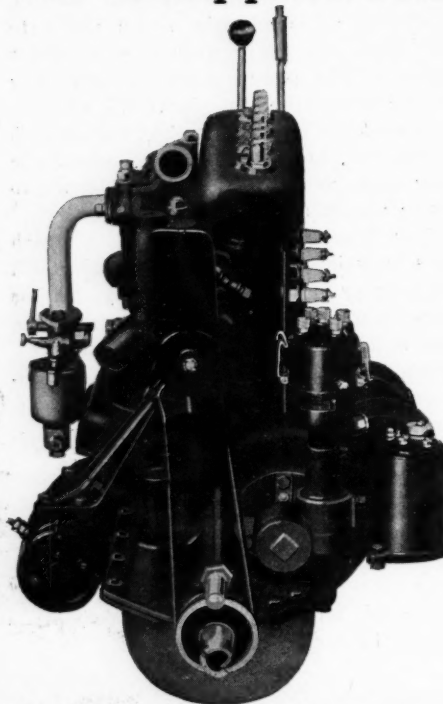
More Comprehensive Data
Given Than Was Obtain-
able at Show Time

ALTHOUGH it was made known at the New York and Chicago shows that the Scripps-Booth Co. would offer for this year a higher-powered, four-cylinder model as well as an eight, and some of the details were given, it was then too early to obtain complete details of the new productions of this concern. Now, however, we are in possession of all of the information bearing on these later cars, the main differences in which are in the powerplants.

Like most other makers, the Scripps-Booth concern has been obliged to raise the prices of its models somewhat, due to the materials situation, the four-cylinder roadster now selling for \$825 and the coupe, which fits to the same chassis commanding a price of \$1,450. The eight-cylinder engine is put in the four-passenger car only, and the chassis for this is 120 inches in wheelbase length instead of 110 inches as is the case with the four-cylinder models. This eight is priced at \$1,175.

Four-Passenger Body

The really new thing in the present Scripps-Booth announcement is the four-passenger body, which follows closely the idea that was prevalent at the shows of making it a sociable affair. There is an aisle between the two front individual seats, this admitting to the rear seat which is 34 inches wide. Entrance to the rear compartment is through the doors at the front seats. The general body lines of this larger Scripps-Booth are the same as those which have been followed in the four-cylinder roadster ever since its inception,



Front view of the four engine which gives a good idea of the general layout

and which have occasioned much favorable comment from the motoring public. The radiator is of the V-type and the hood and front of the body carry out the same slope without any disturbing transitory curves. The rear deck of the new body also carries out much of the same shape as the roadster, and there is a wire wheel rakishly positioned at the end of it. The wire wheels, in fact, add a great deal to the appearance of the car, as is true of all cars in general.

Very little has been altered in the general chassis layout of the new Scripps-Booths as compared with the earlier model, but considerable change has been brought

Prices Have Been Raised
Four Selling at \$825 and
the Eight at \$1,175

about in the power units. In fact, the influence of the same designer is to be seen in both the new four-cylinder and the eight-cylinder engines, for they both adhere to the overhead valve construction with adjustment for the rockers outside in exceedingly convenient position. The four has a bore of 3 inches and a stroke of $4\frac{1}{4}$ inches, whereas the eight is $2\frac{5}{8}$ by $3\frac{3}{4}$ inches. Needless to say, the new four, with its larger motor, has considerable more power, and like the eight, is very accessible for various adjustments or repairs.

Two Unit Starting and Lighting

A change of importance is the fitting of a two-unit starting and lighting system of Wagner make to replace the single-unit system that was formerly fitted to the roadster. The starting motor is placed on the right and close to the flywheel so that it can connect with the flywheel for performing its function. The very popular Bendix automatic meshing and demeshing apparatus is used, whereby the operation of throwing on the starting current by means of a switch in the foot board automatically meshes a pinion on the starter shaft with teeth in the flywheel rim, and once the speed of the engine exceeds that of the starting unit this pinion demeshes again. The details of this starting connection have been thoroughly covered in previous issues, and now are quite well understood by the public. The starting motor is entirely out of the way, being hung from a bracket below the upper part of the crankcase.

On the four the generator is carried on the left and is driven by the camshaft through inclosed gearing. In the case of the eight the generator is carried in the block between the cylinder castings, and is driven by a belt.

One of the motor illustrations herewith indicates clearly how the overhead valves are inclosed completely at the top of the motor. Adjustment of the clearance between the end of the valve rod and the rocker which actuates the valve stem is afforded by the adjusting nut which protrudes through the top of the plate. By means of these adjustments it is possible to adjust the valve clearance while the engine is running, if desired. First, the cap which goes over the adjustment proper is removed and then a screwdriver may be used to turn the slotted head of the adjusting nut, the locking nut having to be loosened first. An experienced person can tell by the feeling of the valve rod just how much clearance there is. This valve adjusting scheme has been described in previous issues in connection with the Ferro eight-cylinder engines designed by the Brush Engineering Association.

Support of the four-cylinder motor in the chassis has also been changed. Instead of hanging the rear end from a bridge, the back part is supported directly in the frame on either side. This makes a more rigid mounting.

Ignition Is Remy

Remy ignition is fitted to the new motors and the means of attachment and drive on the four is clearly brought out in the illustrations. The distributor is vertically mounted, so as to be driven by a worm gear off the front end of the camshaft. The coil is mounted in close proximity to the distributor and both are adjacent to the generator. Centralization of the electric apparatus is the result and it tends to shorter wiring. As the spark plugs are carried in the left side of the cylinder block, it is difficult to see how they could be brought much closer to the distributor.

Simplicity has evidently been striven for in the application of other motor accessories in addition to those already mentioned, a fact which is forcibly brought out by the mounting of the carbureter on the right side and the absence of external manifolding. Distribution of the incoming gases is cared for within the cylinder casting, since there is but a single opening for connection to the carbureter. The exhaust manifold is of large proportions and therefore gives free exit for the burned gases.

The oil pan is a pressing which attaches in the usual manner to the bottom of the crankcase and is sloped to send the oil back to the reservoir at the rear, from which it is drawn by a pump and delivered to the troughs under the connecting rods. This is what might be termed a circulating splash system and applies to the four-cylinder motor only. On the eight the lubrication system is of the pressure type, in which the oil is fed by a pump to the

motor bearings, and thence through drilled passages in the shaft to the crank pins. It is not splashed.

These new Scripps-Booth motors attain moderately high speed, the four having a maximum of 1,800 r.p.m., and the eight running up still higher to 2,500. The reciprocating parts have been designed to take care of speeds running with a marked absence from vibration. In both designs the crankshaft and camshaft are each carried on two bearings of the conventional plain type.

Back of the motor there is practically nothing new to the chassis. A multiple-disk, dry-plate clutch is used and a conventional form of three-speed gearset that is very compact and bolts to the semi-housing that covers the top part of the flywheel and is an integral part of the cylinder casting. The rear axle is a three-quarter floating type, to which the power is conveyed by an open propeller shaft fitted with two universal joints. Front springs are semi-elliptic and the rear set are of cantilever type. In the braking system, the use of piano wire cable connects the brake operating levers with the grounds. These cables are provided with a very easy form of adjustment to take up the slack and have the advantage of extreme simplicity along with freedom from rattles. Scripps-Booth, in fact, is the pioneer in this form of brake.

One other new feature of the four-passenger model is the use of the vacuum system of supplying the fuel to the carbureter, the supply tank being carried at the rear below the wire wheel deck.

Some of the dimensions of the four-passenger body which the Scripps-Booth designers have been able to fit to the wheelbase of 120 inches will indicate the clever-

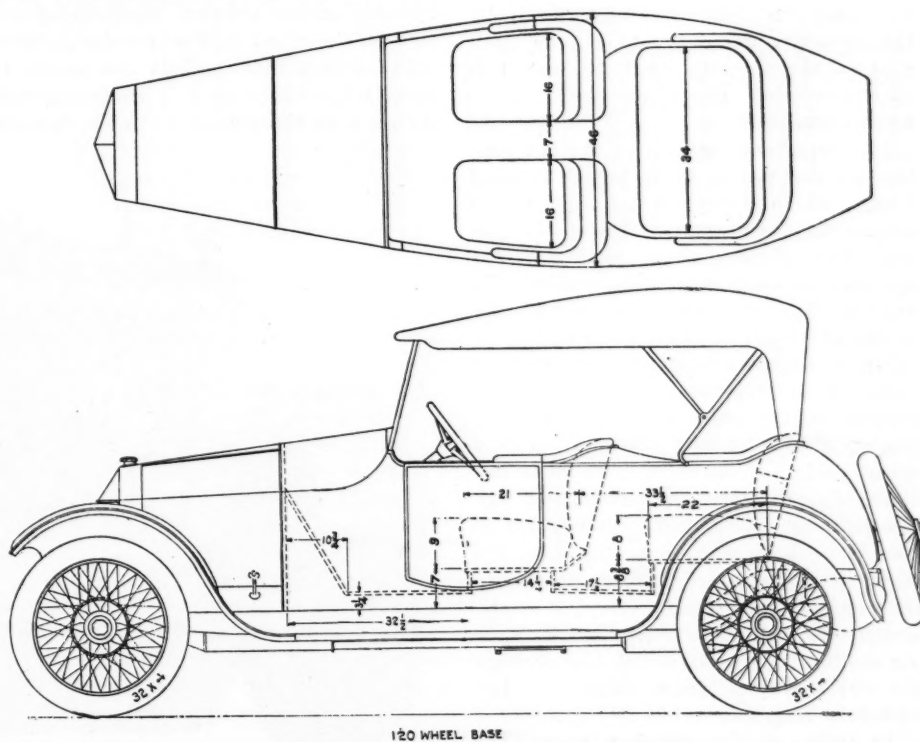
ness with which all of the available space in the body has been used to advantage. From the front to the back of the front seats the dimension is 21 inches and they are 16 inches wide with an aisle between that is 7 inches wide. The greatest width inside the body is 46 inches, and from front seat to back seat is 33½ inches, the distance from the front of the front seat to the front of the dash being the same amount. Easy riding in the back seat is fostered by bringing the seat sufficiently forward so that the passengers really sit ahead of the rear axle with the well-known advantages resulting from such a position.

Tire equipment of the eight-cylinder model consists of five 32 by 4 tires carried on wire wheels. One extra tire and wheel are also supplied to the four-cylinder cars, the tires in this case being 30 by 3½.

WAR AFFECTS BUSES

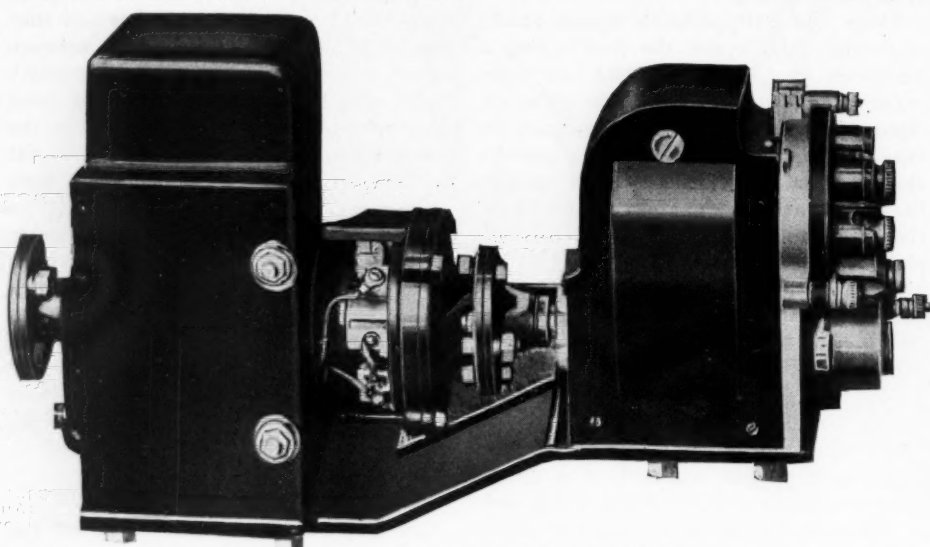
London, March 15—The effect of the war on London traffic is shown by figures issued by the home secretary. The number of motorbuses in service has decreased from 3,876 in July, 1914, to 2,707 in January, 1916. In the same period motor cabs have decreased from 7,746 to 5,813; horse cabs have decreased from 1,666 to 946. The number of trolley cars has remained almost stationary, the official figures being 2,850 in 1914 and 2,733 in 1916. The decreased number of motor vehicles is accounted for by the army requisitions of buses and the calling of taxidivers to active service in the army transport.

In Paris the change has been greater, for the entire bus service of 1,200 vehicles was suspended on the first day of the war; and the 7,500 taxicabs in service just before the war have been decreased to less than 2,500.



Detailed plans showing in inches the four-passenger body, top and side view

Splitdorf Has New Two Unit Starting and Lighting System



Splitdorf two-unit lighting system generators and magneto

A NEW, two-unit, 6-volt, starting and lighting system has been added to the Splitdorf-Apelco line, which incorporates two features of novelty. These are both incorporated in the starting switch and are intended to respectively reduce battery drain and eliminate starting switch troubles.

With the complete Splitdorf system for lighting, starting and ignition there are three units, the generator being intended solely as a means of charging the battery and not incorporating the distributor unit. A separate battery system, of course, can also be used. The installation, as shown in the illustrations, includes a Splitdorf-Dixie magneto for ignition. The layout of a typical system is shown in the wiring diagram, electrically, and mechanically the generator and magneto can be operated off the magneto shaft, because it is an engine-speed type of machine.

Switch Design Novel

The important features of the new system are wrapped up in the switch starting design, which incorporates a very clever scheme for the purpose of taking the control of the starting motor away from the operator as soon as it has cranked the engine. This is shown diagrammatically in the accompanying illustrations.

When the operator presses the starting pedal or button, the mechanical act of pushing on the pedal meshes the starting pinion, which slides up into position on a spiral guide. A slight mesh is made mechanically, therefore, in advance of any electrical action. A further movement of the foot closes the contact across the starting switch, which is made up of two independent rods, each carrying a U-shaped contact piece. Contact is made across the rectangular switch box through the two U-shaped pieces, which are illustrated in diagram.

As soon as the starting motor has cranked the engine, the motion of the lat-

ter throws the pinion back along the spiral sleeve guides. The pinion shaft travels back with the pinion and carries with it one of the two switch plungers, thus breaking the contact, although the foot still remains on the starting pedal. In other words, the action of the driver in holding his foot on the starting motor pedal has no effect on the battery, and the starting motor is independent of the driver as soon as the motor has cranked the engine.

The action of the driver in pushing the pedal or pulling the starting lever causes the pinion to be carried in mesh with the flywheel ring gear, and when the engagement is made, current flows through the motor as described. As the gear is held movably on the armature shaft, being carried by the spiral guides in a sleeve, these spiral guides tend to hold the pinion in mesh while the engine is being cranked. As soon as the engine picks up it turns

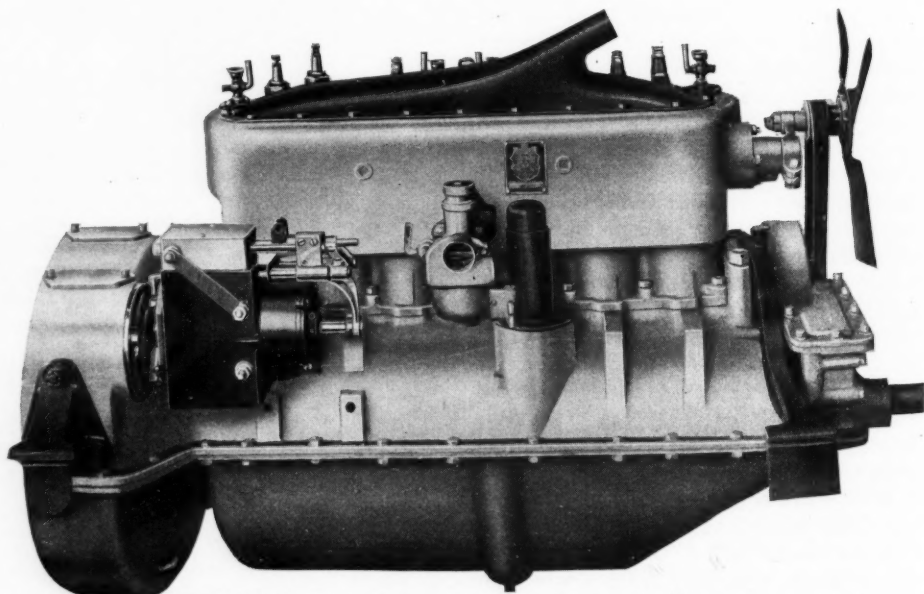
Two New Features Incorporated, Designed to Reduce Battery Drain and Starting Switch Troubles

faster than the motor pinion, which is engaged with the flywheel, and on account of the spiral splines the gear is forced out of mesh with the flywheel ring.

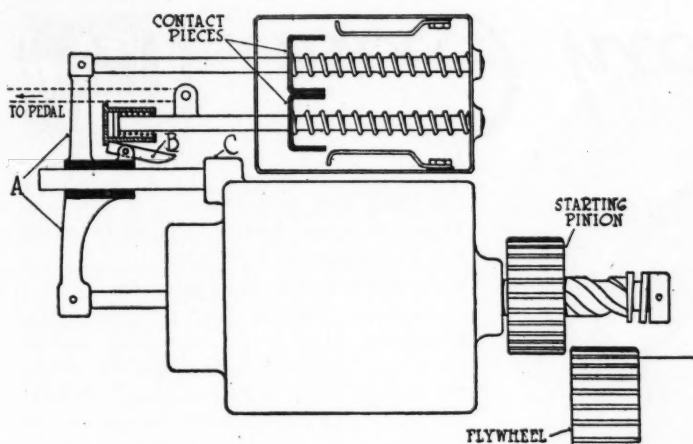
The pinion is mechanically connected to a rod, which in turn is joined to one of the switch rods in the starting switch. When the motor is first engaged with the flywheel, the switch rod is pulled into engagement by means of the connecting rod and is held in an engaged position under spring tension. As soon as the gasoline engine begins to operate, the gear on the splined sleeve is thrown out of mesh and the connecting rod is forced to its original position. As this rod moves back the engaging latch mechanism is moved to an inoperative position. By this arrangement, since contact is broken as soon as the engine starts to rotate under its own power, the minimum amount of current is used in starting, thus conserving the supply in the battery. The switch contacts are always disengaged with a quick snap, to prevent the formation of an arc, thus giving long life to the switch contacts.

In working out the installation of this system the motor is designed to have a twelve-tooth pinion wherever possible. It is a straight, series-wound machine and like other parts of the system can be installed either in connection with a two-wire or grounded return layout.

The generator is shunt wound and is driven at engine speed. It is arranged to cut in at from 6 to 8 miles per hour. The regulation is a new system of voltage con-



Right side of motor, showing method of attaching starting motor



trol worked out by the Splitdorf company, so arranged that the current output will not exceed a certain maximum, even though the engine is speeded to its limit. This is accomplished by means of a keeper operated across pole extensions. The keeper goes in and out of contact with the voltage fluctuations responding to the voltage delivered by the generator in proportion to its speed.

In the construction of the generator attention has been paid to making the job accessible. A movable lid, for instance, is placed over the commutator brushes, so that when the lid is removed the brushes are exposed to view and are readily accessible.

Generator Cuts in Early

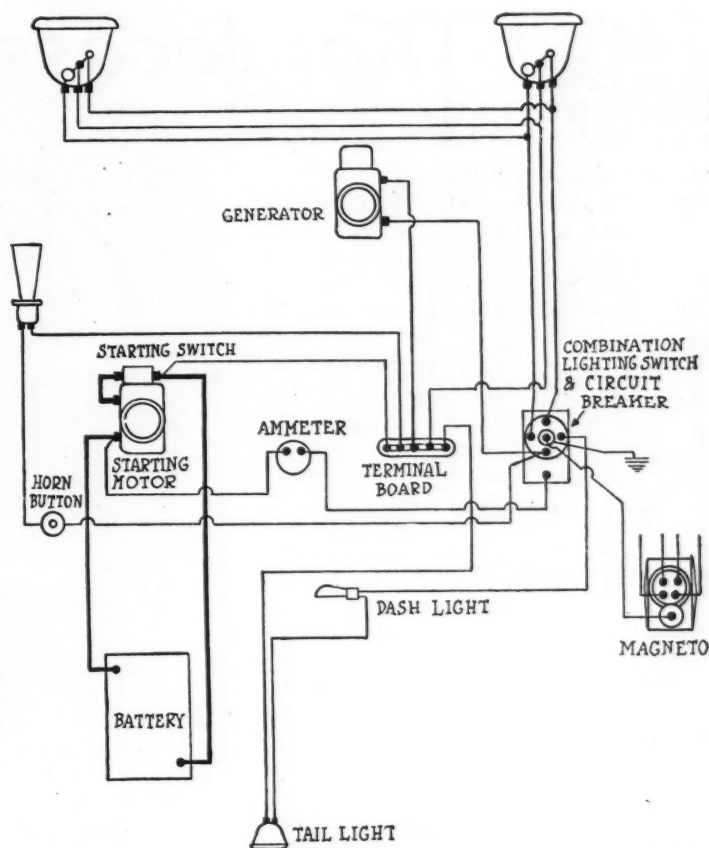
Taking the entire assembly as a whole, this should make a good installation for a car which is started and stopped frequently. The generator cuts in early and also, due to its inherent characteristics, gives a tapering charge to the battery. If the battery is nearly discharged, the generator will put in a larger amount of current than when it is nearly charged; speed conditions being assumed equal in both cases. When the lights are used but little the current is held to a low value, thus preventing boiling of the battery electrolyte.

The regulator is mounted directly on top of the body of the generator and incorporates with it the automatic cutout. On the electric motor the starting switch is carried on the top of the machine, so that the car manufacturer does not need to make any starting switch installation on the car. All that has to be done is to install connecting linkages, to give the proper transmission of motion from the starting pedal to the switch.

PACKARD SALES SET GOOD PACE

Detroit, Mich., March 31—The Packard Motor Car Co. has delivered 4,308 twin-six motor cars. The factory is exerting every effort to cope with the freight car shortage and make deliveries. With the coming of spring weather customers are growing even more impatient to receive their cars, which accounts for speeding up delivery.

Diagrams showing method of starter operation and the wiring connections for both the cranking and lighting units in the new Splitdorf system



Has Chemical Rubber-Making Process

Minnesota Man Has Formula for Making a Substitute for Natural Product

DULUTH, Minn., April 1—E. Angemeier, M. D., chemist and electrician of this city, has invented a chemical rubber which he believes will replace the natural product.

"This invention," said he, "is the work of a lifetime. I am now 76 years old, having worked on a chemical rubber for the last 30 years.

"With oils and tars I have made a rubber that is even better than the natural product. It costs only one-sixth as much, is as elastic and more durable than ordinary rubber."

In his laboratory at 31 East Superior street Mr. Angemeier has this product in all its stages of production and also some of the completed product.

It is of a dark brown color and has the appearance of rubber, so much so that when a visitor noticed it in the course of developing he asked what was the object of mixing that rubber stuff. The odor is similar to rubber and the weight about the same. It shows elastic tendencies. When properly handled, Mr. Angemeier says, it will be a useful commodity in the lines of industry that now use rubber. The cost is said to be less than the rubber obtained from the Para plant. The facilities are not at hand to develop samples in the many different ways that can be of use, according to the chemist-inventor, but

there is in hand a chemical rubber that has been pronounced a success by a master chemist.

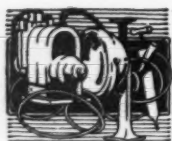
NEW MILLER TRUCK TIRE

Akron, O., March 31—The Miller Rubber Co., of Akron, has developed a new type of solid tire for motor trucks and has secured the services of J. B. Bleiler, formerly vice-president of the Overman Cushion Tire Co., as manager of the solid truck tire department.

The new tire is of the demountable type, being secured to the rim by twelve bolts. Its feature is a cushion strip between the hard tread composition and the base, by which increased resiliency is secured without impairing the wearing qualities of the tread.

NEW CHASSIS FOR OLD RELIABLE

Chicago, March 31—A new 5-ton chassis has been produced by the Old Reliable Motor Truck Co., which embodies as special features a low frame with a goose-neck over the rear axle, worm drive, a Duplex governor, Carter vacuum fuel feed, Hotchkiss drive and a tubular drive-shaft with but two universals. The truck has a Wisconsin engine, 4¾ by 5½, a Stromberg carburetor, Bosch magneto Sheldon axles, Spicer joints and a Brown-Lipe gearset.



The Accessory Corner



St. Louis Magneto Tester

THE St. Louis Magneto Tester makes it possible to take readings and tests of Ford magnetos by a simple operation. It is only necessary to connect one lead from the tester to the magneto terminal under the hood, then ground the other tester-lead on the car, start the engine, and the meter of the tester will read the exact condition of the magneto.

It does not matter what speed the engine runs, so long as it is running. In addition to indicating magneto trouble, the tester will show whether the

flywheel or a main bearing is loose. In this case the air gap between the magnets on the flywheel and the magnet coils varies while the engine is running, thus causing a variation in the magnetism. As the magneto tester measures only the strength of the magnetism, it will indicate any variation in the magnetism by a swinging of the pointer. It is made by the St. Louis Electrical Works, St. Louis, Mo.

P. D. Q. Grease Gun

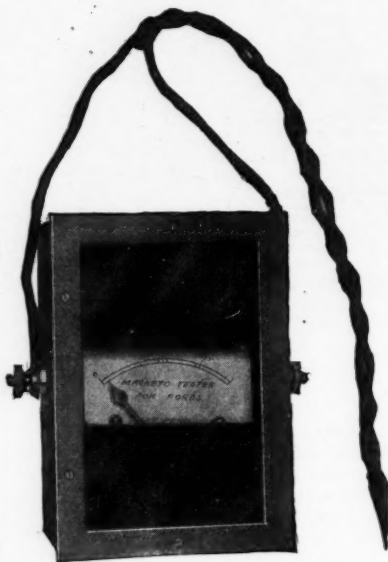
The Star Brass Works Co., Kansas City, Mo., calls its new grease gun a breach loader. The illustration indicates the principle of the device. It somewhat resembles the automatic suction-valve springs made for pulling doors shut, the grease being loaded with a paddle into a brass cylinder or cup and forced into the car as the hand lever closes down upon it. The gun will shoot 18 ounces of grease in one minute and is clean in its operation. The retail price is \$2.50.

New Ford Tire Holder

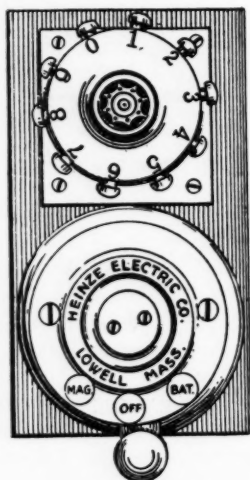
The Asco rear-end tire-holder for Ford cars, illustrated herewith, has a hand-wheel attachment which expands the rim to secure the tire in place or contracts it when turned in the opposite direction. By drilling a hole for the valve stem it will carry a demountable rim. It is made of sheet steel and malleable castings. The American Auto Specialty Co., Peru, Ind., has just put the article on the market.

Keyless Lock and Switch

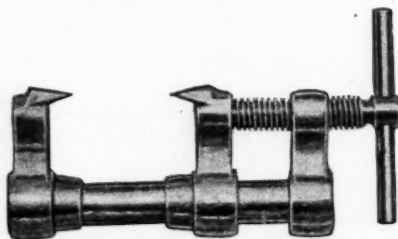
A keyless lock which takes the place of the regular switch and is such that the battery and magneto circuits can be switched on only by means of a combination, is an invention patented by George A. Wehner, Savannah, Ga., which he expects soon to handle through a manufacturing firm. The illustration shows one of these locks equipped with a Heinze switch. It is operated by pressing a selected series of



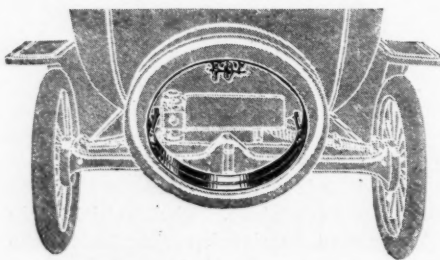
The St. Louis magneto tester



Wehner keyless lock and switch



Knowlson's spring leaf spreader



Asco tire carrier for Fords

buttons on the dial. It locks by turning the small disk in the center of the dial. There are some 40,000 combinations which can be changed in 5 minutes.

Knowlson's Spring Leaf Spreader

Knowlson's spring leaf spreader is intended to prevent the annoying squeak sometimes heard in springs and to render the springs easier riding and more durable by permitting the leaves to be spread and lubricated at regular intervals. Use of the spreader for this purpose also prevents rusting, freezing and other deteriorating troubles which lead to breakage. The spreader weighs 15 ounces. Projecting teeth are forced between the leaves from either side by means of a thumb screw. The Spring Leaf Lubricator Co., Ann Arbor Mich., manufactures the device. It sells at \$1.50 net.

For the Man Behind

Louis F. and John C. Simpson, Portland, Ore., are the inventors of an automatic signal which attaches to the rear axle of a motor car to notify the driver of another machine when the car ahead is about to turn or stop. Instead of an arm being extended at one side of the machine ahead, a white disc and an arrow will flash in sight to inform him which way the other man is going to turn, or, a stop signal will appear on a white space beneath, lettered so that it can be seen plainly by the man behind. The apparatus is compact and is contained in a flat, steel case, 7 inches by 9 inches. Every slackening of speed is accompanied by a warning signal and when the break is applied in the slightest degree the stop signal appears.

Three-X Spark Plugs

The spark plugs sold under the brand 3-X, manufactured by the 3-X Spark Plug Co., Chicago, are said to possess great flexibility in meeting the variations of the motor under favorable and unfavorable conditions, which is essential in avoiding ignition troubles. Among the several 3-X spark plugs is the 7/8-inch S. A. E. extension type; the 1/2-inch extension Ford, Overland, Reo, and the Metric, adapted to various motors.

New Cooling System for Ford Cars

The New York Coil Co., of 338 Pearl street, New York City, has just brought out a cooling system for Ford cars in which the heat extracted from the cooling water is utilized through the carburetor to assist in vaporizing the present low grade gasoline. The device is attached by substituting it in the place of the side water connection, located between the bottom of the radiator, and water inlet on side of cylinder, replacing with the above device. It consists of a copper tube, having an internal division of brass. Around the outside of this brass water pipe are radiating

fins $\frac{5}{8}$ -inch in height, secured by solder, and around the outside of these fins, a metallic jacket is formed, closed at the upper end, and open at the bottom end. Near the closed end of the jacket, a $1\frac{1}{4}$ -inch flexible metallic tube is connected, the other end of flexible tube being secured to the air inlet of carbureter. Air entering the carbureter is drawn through the radiating fins. The price is \$5.

Willson Resilient Rims

Two patents have been issued to F. R. Willson, of the Willson Resilient Auto Rim Co., Worthington, O., upon a wheel for motor cars and trucks with resilient rim which is designed with unit sets of compression springs so placed as to be counteractive in receiving the jar of travel.

Eight clusters of coil springs, each cluster or unit consisting of six springs arranged in pairs and set in radial and circumferential positions, are grouped within a metal encased channel, as shown in the illustration at the top of this page, and the channel closed by bolting on side-plates.

The ends of these springs are attached to pivoted cap ends and the cap ends are pivoted to the inner and outer channels. While the wheel is in action the springs in the lower half are in compression and those in the upper half are out of compression. Over the outer channel is a solid rubber tire. The rim may be placed on any wheel simply by reducing the diameter of the wood felloe and pressing the rims over the new felloe.

Marvel Re-Boring Machine

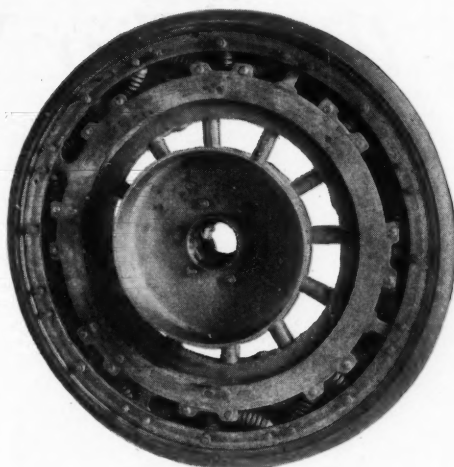
The new model of the Marvel cylinder re-boring machine, a product of the Marvel Machinery Co., Minneapolis, Minn., is built upon a one-piece frame. Special provision is made for securing perfect alignment of the cylinder. The cutting device is adjustable down to a $1/1000$ inch and is equipped with three separate cutting heads. The machine is built in two models, selling respectively for \$175 and \$200 f. o. b. Minneapolis.

Noonan Valve Reseating Tool

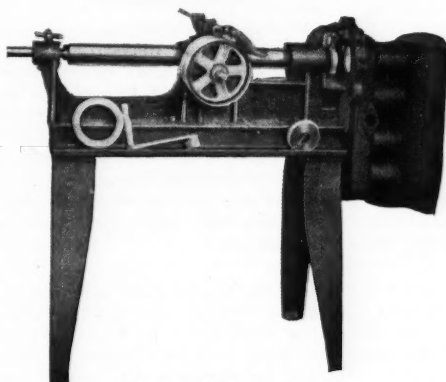
D. R. Noonan, Paris, Ill., is manufacturing a valve reseating tool like that in the illustration which can be ordered in sizes to fit any car made. By supplying the smallest diameter of the valves and the diameter of the valve plug where the valve goes into the cylinder, a total is obtainable which the manufacturer guarantees will fit. The price is \$5, with special discount to the trade.

Portable 2 Horsepower Engine

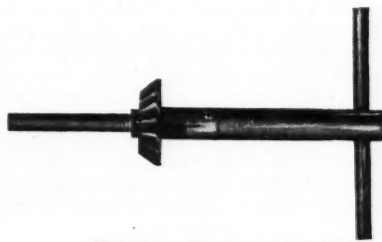
C. Benninghofen & Sons, Hamilton, O., manufacturers of gas power plants and engines, are building a new single-cylinder four-cycle, verticle, portable, gasoline engine of 2 horsepower, adapted to garage and small machine shop work. It is mounted on skids 40 inches long overall. With the exception of the main bearings, the oil cup on top, which appears in the



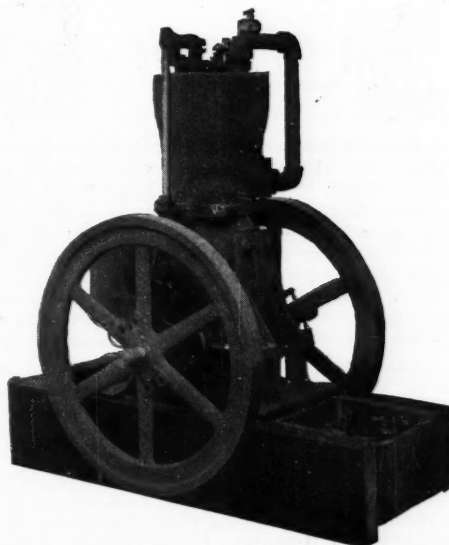
Willson resilient rim



Marvel re-boring machine



Noonan valve reseating tool



Benninghofen portable 2-horsepower engine

illustration, lubricates the entire interior of the engine. Excess oil from the cylinder drops upon the connecting rod and lubricates the crank pin and piston pin. Cooling is taken care of by a hopper which completely surrounds the cylinder, but which is not a part of it. The cam for opening the exhaust valve is cast directly to the timing gear, which operates at half the speed of the crankshaft. The gas mixture is regulated through the medium of a sliding valve actuated by governor balls in the flywheel acting against a conical collar on the shaft. The maximum r.p.m. is 600. The stroke is 5 inches, the bore 4 inches. When mounted, the overall height is 42 inches. The shipping weight is 500 pounds and the price \$35 f. o. b. cars Hamilton, O.

Gardner Automatic Air Unit

The latest model of stationary air pumping outfit produced by the Gardner Governor Co., Quincy, Ill., consists of an air-cooled, splash lubricated pump belted to a $\frac{1}{4}$ horsepower electric motor, mounted on an oak frame and set above the tank, an arrangement which makes for greater compactness.

An endless belt is used, the slack being taken up by a sliding base on the motor. An automatic controller is mounted between the pump and motor. It is built in two sizes, one having a capacity of $1\frac{1}{4}$ cubic feet per minute and the other $2\frac{1}{2}$ cubic feet per minute. The cylinder of the air compressor has a 2-inch bore; $1\frac{1}{4}$ -inch stroke in the smaller model, and $2\frac{1}{2}$ -inch stroke in the larger model. A booklet has been issued giving complete description of the outfit.

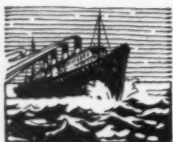
Bettendorf Trailers

The design of the Bettendorf trailer, or tractor-semi-trailer, includes as its most vital feature the rocking, fifth wheel, on which the forward end of the trailer body rests. It is placed above the rear wheels of the motor car or truck to which it is fastened, thus using part of the weight of the trailer for traction and distributing the weight of the load upon four wheels instead of two, as is usual with the regulation trailer.

The Bettendorf trailer is being put on the market by the Bettendorf Trailer Co., recently organized at Bettendorf, Ia. The company specializes in trailers for Ford cars and is now featuring both the regulation type of trailer and the tractor-semi-trailer type.

Burrows Shock Annihilators

A shock absorber for Ford cars which is designed to have full control of the side sway and the rebound is being introduced by the Burrows-Overton Co., New York City. This is a newly invented accessory and will be known as the Burrows Shock Annihilator. It is constructed with a top bar of 1-inch by $\frac{3}{8}$ -inch spring steel, with a 2-inch coil spring which attaches to the chassis bar. An expansion spiral spring hooks to the hub-bracket with special designed hook. It sells at retail for \$3.50.



From the Four Winds



PUGILISM AND MOTOR CARS—There are always two extremes to everything if we look for them. The man who robs the baby's bank to round out the sum necessary to buy a motor car is one extreme of the class who buy cars, and Jess Willard, heavyweight champion of the world is the other. Jess placed an order for a Cole eight just before the recent fight between himself and Moran. The average car buyer feels pretty good if he saves enough out of a year's salary to buy a car selling up around the \$2,000 mark, but it took Jess 45.13 seconds to earn enough to pay for the new Cole—\$1,785. He got \$4,750 a round and figuring that he was fighting only 2 out of every 3 minutes, earned \$2,375 a minute. In the illustration above Willard is shown sitting at the left in the rear seat. He is handing a check to the R. P. Henderson of the Cole company. Next to Willard is his secretary and in the front seat is Tom Jones, Willard's manager.

GARAGE Responsible to Car Owner—In a decision handed down by Judge Ruth in the municipal court at Columbus, O., owners of garages are held responsible for the acts of their employes in charge of cars left in their care. William K. Krauss sued Albert B. Brightman for damages done to his car while stored in Brightman's garage when an employe drove it and sustained an accident.

License Tags Cheaper Than Fines—The sheriff of Kankakee county, Ill., during the last two weeks of March, arrested eight owners of motor cars who had neglected to procure the Illinois license plate for 1916. Some time ago warning was issued, but a large number of car owners ignored it. The sheriff now proposes to arrest all who have failed to register for 1916. All of those arrested pleaded guilty and were fined \$14.25 each.

City Investigates Garages—Building inspectors are making an inspection of the 100 public garages and motor car repair shops of Louisville, Ky. The records are being kept on score cards and at their completion the building inspector will issue a general order covering this class of buildings. It is practically certain that the new rule will require all garages and repair shops located in frame stables and sheds to move into quarters of fireproof construction.

Motor Car Carries Seven Tags—A Ford car bearing seven different state license tags drove into the Los Angeles ignition works one day last week in order to have a starting and lighting system installed. The car had made a transcontinental trip and had remained long enough in seven states that the owner was compelled to take out a license in each of the seven. The last, a California tag, was placed over the other six, which were retained as souvenirs of the trip.

Motor Cops Busy at Minneapolis—Renewal of active enforcement of motoring ordinances at Minneapolis, Minn., with the return of spring, resulted in an arrest the first day of more than 100 owners and drivers of cars, including fifty from St. Paul, the latter not

being familiar with Minneapolis regulations. Bright lights, no lights, and passing open streetcar gates were cited as the principal offenses. The order was unexpected and the result showed indifference to ordinances that had grown up through the winter. The special committee of the Civic and Commerce Association is ready to receive complaints from citizens.

When is a Jitney not a Jitney?—In a decision handed down by the Illinois state board of public utilities it was held that motor car service is not a jitney business unless it operates over specified routes and on a schedule. The case came up from Hillsboro, Ill. The operators of the cars maintained that they could not be classed as common carriers. A similar situation exists at Rock Island, Moline and Davenport,

The Show Circuit



Show in Progress at Champaign, Ill.—In cooperation with the Chamber of Commerce of Champaign, Ill., the Automobile Trade Association of Champaign County is conducting an open air motor car show on the streets of Champaign this week. Beginning April 5, the affair will continue until April 8. The show is held in conjunction with the annual spring style show. About forty booths have been engaged by dealers and accessory firms.

Lexington, Ky., Show—A large tobacco warehouse was converted into a canopied exhibition hall for the motor show held last week in Lexington, Ky. Elaborate preparations were made by the committee.

1916 Show for Atlanta, Ga.—Arrangements for holding a motor show this season in Atlanta, Ga., are being made under the direction of a committee of the Atlantic Automobile and Accessories Association.

in which a suit is pending, filed by the street car company.

Snow-Plow Behind Motor Cars—Five Briscoe cars in the regatta of their testing period, towing a huge snow plow, helped the city authorities of Jackson, Mich., cut a passage through the snow after a storm on the first day of Spring, thus opening a path for snow-bound vehicles. It amused the snow-laden crowd to watch the five testers hurling the snow 10 to 12 feet into the air with their chain-clad wheels and every once in a while throwing one of the men, who acted as ballast for the swiftly moving plow, headlong into the snow.

Jersey License Fee Higher—Governor Fielder has signed the bill passed by the legislature of New Jersey establishing a uniform driver's license fee of \$3.00 in place of the former fees of \$2 for a license to drive cars of less than 30 horsepower, and \$4 to drive cars of over 30 horsepower. This will increase the state's revenue from this source more than \$50,000, as out of nearly 125,000 licensed drivers in the state, less than one-fourth take out \$4 cards. An additional fee of 50 cents will also be charged for the issuing of a permit to allow a novice to fit himself for examination for driver's license. Formerly this was free. The number of special motor vehicle inspectors has also been increased from thirty to seventy-five.

Motors Beat Trains—One of the interesting facts in connection with the development of the state highway system of California is the improvement the new roads have made possible in motor travel between Los Angeles and the San Joaquin valley, especially the assistance these roads have given to the cars which compete with the railroads for passenger traffic between the southern and central parts of the state. At the present time there is in operation between Los Angeles and Bakersfield a fleet of four Packards which make the run between the two cities $\frac{1}{2}$ hour faster than does the fastest train on the Southern Pacific. As a matter of fact the actual running time of the autos is one full hour less than that of the train, but a $\frac{1}{2}$ -hour stop for lunch makes the total time of the Packards 6 hours as against the railroad's schedule of 6 $\frac{1}{2}$ hours. The Packards carry nine passengers each and usually have a fair load of luggage.

Fire Department Washes Private Cars—The Auto Dealers and Garage Owners Association of Freeport, Ill., has filed a complaint with the city council to the effect that the members of the city fire department are devoting much of their time to washing automobiles for private car owners, thus taking revenue from the public garages that rightfully belongs to the latter institutions. The council is asked to prohibit the firemen from engaging in such duties, it being charged that water for which the city pays is being utilized, together with other city property. The firemen, it is asserted, are willing to wash cars for a smaller sum than is profitable to the garages and thus the latter lose patronage. The firemen have filed a reply to the petition in which they claim that they do better work than possible at the garages, in that they are careful not to mar the cars. The further claim that this washing is done in hours when their work for the city is over and when they have leisure. The money realized, they maintain, is used in purchasing clothing, caps, badges, chamol skins, sponges and other supplies which ordinarily should be purchased by the city.

Good Roads Activities

New Association Organizes—At a meeting held at Moorehead, Minn., the Park Region and Red River Valley Association was organized in an effort to have the Jefferson highway from New Orleans to Winnipeg routed through that section.

Columbia University Highway Course—Columbia University will hereafter confer the degree of Master of Science upon graduate engineering students who satisfactorily complete the graduate course in highway engineering. From 1911 to 1915, the graduate engineering students who have specialized in highway engineering have been candidates for the degree of Master of Arts.

Averting Road Difficulties in Oregon—The county court of Gilliam county, Oregon, has ordered that no motor truck shall carry a load exceeding 500 pounds when the roads are muddy and soft enough to require chains on the wheels to prevent them from slipping. It has further been ordered that no traction engine shall be allowed to haul any load without a permit of the county court.

Appalachian Roads Conference Sept. 5—The Southern Appalachian Good Roads' Association will hold its annual convention at Lexington, Ky., during the week of September 5, according to arrangements fixed last week at a conference between state officials and the Board of Commerce. The Kentucky Good Roads Association will be in session at the same time. Nine states are in the Appalachian region. The governor of each state will be invited to attend. Five hundred delegates are expected.

Red Trail Association Elects Officers—Officers were elected by the Red Trail Association at a recent meeting in Fargo, N. D., meeting attended by representatives from Minnesota, North Dakota and Montana. The route suggested by the National Highway Association was adopted, being practically the original Red Trail location. Adoption of insignia for marking, etc., was recommended and laws against the obliteration of the markings. The officers are: W. W. Smith, Fargo, N. D., president; W. J. Ray, Medora, N. D., vice-president; J. P. Hardy, Fargo, N. D., secretary; John Orchard, Dickinson, N. D., treasurer.

Established Roads Have Precedence—Maintenance of roads already constructed must be given preference in Ohio over the building of new roads, according to an opinion by Attorney General Turner on the Cass road law. He ruled that an appropriation of \$20 a mile for repair and maintenance of county roads must be made each year by county commissioners, regardless of the funds available for the building of new highways. The opinion held the repair and maintenance provision of the law mandatory. If any curtailment of funds is occasioned by the limitations of the Smith law, it should be made in the annual estimates for new road construction.

Farmers Fight Good Roads—Iowa farmers from twelve counties who recently met at Cedar Rapids and formed the Iowa Farmers' Protective Association, have begun a statewide campaign against the good roads plan of the Greater Iowa Association, believing that the Greater Iowa plan would entail a state bond issue of \$170,000,000. The Greater Iowa plan calls for approximately \$18,000,000. The Greater Iowa Association is financed by wealthy implement manufacturers and prominent business men. It will devote its entire efforts this year, from Davenport as a center, in securing a constructive good roads system with sufficient appropriation from the Iowa legislature. This association hopes to be able to convert the farmers of the state to favor its propaganda. The farmers who organized

the protective association say the burden of better roads will fall largely on them as they are the heaviest tax payers.

Show Funds for Road Marking—The first annual Pacific coast motor power and show is to be held in Oakland's million dollar municipal auditorium from April 26 to May 6. A considerable share of the funds realized as a result of the show will be turned over to the Lincoln Highway Association committee of the Oakland Chamber of Commerce for the marking of the official route of the Lincoln highway as far east as Salt Lake City.

Paving Famous Boulevard—Work has been commenced at Atlantic City, N. J., on the paving of the famous Meadow boulevard, the only highway from the Jersey mainland to Absecon island, on which Atlantic City stands. This road is 6 miles long and varies in width from a 12-foot bridge to a 100-foot speedway. The paving will extend the entire length of the boulevard, from Pleasantville, N. J., on the mainland, to the Albany avenue bridge in Atlantic City. It will be thirty feet wide and of warrenite, a paving material that is much in favor in many large cities.

County Fought Road Law; Now Gives Aid—Outagamie county, Wis., of which Appleton is the county seat, has taken rank as one of the most progressive counties in America in relation to the good roads movement by authorizing a bond issue of \$700,000 to build a system of county highways which will place Appleton in touch with every part of the district. It was only a few years ago that a movement to kill the state aid highway law of Wisconsin was started in the same county, and it is claimed that the agitation resulted in placing the benefits of good roads before the city and country people in so striking a manner that when the county board took up the bonding proposition, it was carried easily and with little opposition.

Coming Motor Events

SHOWS

April 10-15—Seattle, Wash., show.
April 12-15—Calumet, Mich., show.

CONTESTS

April 8—Corona, Cal., boulevard race.
May 6—Sioux City, Ia., speedway race.
May 13—New York, Sheepshead Bay speedway race.
*May 20—Chicago speedway amateur's race.
*May 30—Indianapolis speedway race.
May 30—Tacoma, Wash., speedway race.
May 30—Minneapolis, Minn., speedway race.
*June 10—Chicago speedway race.
June 28—Des Moines, Ia., speedway race.
July 4—Minneapolis speedway race.
July 4—Sioux City speedway race.
July 4—Track meet, Coeur d'Alene, Ida.
July 15—Omaha, Neb., speedway race.
July 15—Track meet, North Yakima, Wash.
August 11-12—Hillclimb, Pike's Peak, Colo.
August 5—Tacoma speedway race.
August 18-19—Elgin road race.
September 4—Indianapolis speedway race.
September 4—Des Moines, Ia., speedway race.
September 4-5—Track meet, Spokane, Wash.
September 16—Speedway race, Providence, R. I.
September 29—Track meet, Trenton, N. J.
September 30—New York, Sheepshead Bay speedway race.
October 7—Omaha speedway race.
October 14—Chicago speedway race.
October 19—Indianapolis speedway race.

* Sanctioned by A. A. A.

With the Motor Clubs

New Motor Club in Nebraska—Through the activity of the Chamber of Commerce, Alliance, Neb., is to have a motor club.

Membership Campaign at Wadsworth, O.—At the annual meeting of the Wadsworth Automobile Club, officers were elected as follows: H. A. Baldwin, president; Carl Niswender, vice-president; H. G. Bartlett, secretary-treasurer. The club has started a campaign for 200 members during the year 1916.

Ohio Club Adopts New Name—The Elyria Automobile Club, of Elyria, O., has been re-named the Lorain County Automobile Club. It boasts of more than 200 members. A smoker was held recently. H. M. Andress is president; M. F. Harrison, vice-president; A. L. Hahn, secretary; Claude Beebe, treasurer.

Club Reduces Its Dues—The Chehalis Auto Club, Chehalis, Wash., at its annual election named O. J. Albers, president; T. C. Rush, first vice-president; J. F. McDonald, secretary-treasurer. The above named officers, together with W. E. Bishop and T. R. Behrend, constitute the board of trustees. Membership dues have been reduced from \$2.00 to \$1.50 per year.

Motorists Want Trees Preserved—In an effort to preserve the trees along the Dallas road near Wilkes-Barre, Pa., from the Luzerne toll gate to Ice Cave hotel, the Wilkes-Barre Automobile Club is negotiating with the lessee of the land to purchase the timber so that it will not be cut. As soon as the weather permits the club will pave, at its own expense, a triangular piece of road lying between Luzerne and Courtland Boroughs.

Revise Dimmer Ordinance at St. Paul—Secretary T. M. Johnson of the St. Paul Automobile Club has drawn an ordinance for approval by the club and city council relating to the dimming of headlights. The present ordinance leaves it to the discretion of each policeman to decide whether the lights are too bright. The proposed law requires a lamp shedding a ray of light 75 feet to be adjusted so the beam will not be higher than three feet above the ground.

Pittsburgh Club Gets Busy—In an effort to further increase its membership, the Automobile Club of Pittsburgh will next week send to its members the names of about 1,000 owners of motor cars in Pittsburgh, Pa., whom the club would like to take membership in that organization, urging the members to obtain their membership. This will be one of the features of the club in their movement to oppose by a strong organization any attempt on the part of the city to impose a tax on owners of cars.

Southern California Club Largest—President Frederick L. Baker, of the Automobile Club of Southern California, has issued his report for 1915, which shows that this club is the largest of its kind in the United States, and that the past year was the most active year in the club's history. The touring information bureau of the club, it is shown in the report, answered 50,784 inquiries in regard to roads, and the branch offices assisted in solving 25,445 motoring difficulties. This makes an average of 140 a day, but the number of inquiries answered on some days ran far up into the hundreds, the highest number being for a day in January when the club's officials responded to 1,200 calls for information and assistance.

The club acted as official host to more than 36,000 visiting motor parties and distributed to its members and to visiting motorists 380,000 maps which logged the entire road system of southern California. These were printed by the club's own printing department.

Among the Makers and Dealers



INTERSTATE HAS BIG DRIVE-AWAY

DAY—One of the biggest drive-away days ever held in Indiana was staged on March 16 by the Interstate Motor Co., when, after a fitting banquet and entertainment the night before, 180 dealers and friends from Ohio and Indiana, drove home 150 Interstate cars. The enthusiasm of the whole affair is shown by the fact that the mercury was well below the freezing mark and about 2 inches of snow covered the ground. The illustration above shows how the cars were lined up ready to be driven to waiting buyers.

TIRE Company Increases Capital—The McGraw Tire & Rubber Co., East Palestine, O., has increased its capital from \$1,475,000 to \$3,000,000.

Firestone Service Men Meet—In order to secure new and better ways of serving the tire-using public the service men of the Firestone Tire & Rubber Co. from every corner of the United States met in their fourth annual conference at Akron, O., March 16, 17 and 18.

Tractor Firm Leases Factory—The Waite Tractor Co. has removed to Elgin, Ill., from Chicago, and has commenced operations in its new quarters. The Elgin Commercial Club has given the company a bonus of \$1,000 and rent free for one year. In the past the company has contracted for the manufacture of its machine, but recently decided to establish a plant and manufacture the product themselves. The tractor can develop a speed up to 15 miles per hour and can be utilized for farm machinery power as well as field or road work.

Grant Company Re-Organizes—Grant Motor Co., Findlay, O., manufacturers of the Grant six, has been re-organized and its entire property and assets taken over by Grant Motor Car Corp. with a capitalization of \$4,000,000. The new company absorbs all the rights and liabilities of the old company. Andrews & Co., bankers, Chicago, together with prominent New York and Boston financial interests, have been instrumental in the formation of the new company. This large increase in capitalization means greater manufacturing facilities, and a big increase in production, the estimate for the coming year being 15,000 sixes. The old working organization remains intact. D. A. Shaw, as president, assisted by George S. Waite, sales

manager, George S. Salzman, production manager, James M. Howe, engineer, will continue as the active working heads at the plant.

Chalmers Convention in Minnesota—Retail dealers in Chalmers cars in Minnesota will have a company convention in the Twin Cities, March 31 and April 1. Hugh Chalmers, Paul Smith and J. H. Falk are expected to attend as well as more than 200 dealers.

Westinghouse Effects Contracts—Among the new distributors recently signed up for Westinghouse starting, lighting and ignition systems for Ford cars is the Central Rubber & Supply Co., of Indianapolis, Ind. The Owen Schoenck Company of Chicago, Ill., has closed a contract with the Westinghouse company for electric starting and lighting equipments for its six-cylinder trucks. The Westinghouse company announces three new distributors for its Ford starting, lighting and ignition equipments, as follows: Alex. Seewald Co., Atlanta, Ga.; Hirzig Co., Inc., Nashville, Tenn.; Rose-Lyons Hardware Co., Little Rock, Ark.

Quality Co. Adopts New Name—At a meeting of the stockholders of the Quality Tire & Rubber Co., Hartsville, O., to be held April 8, the name of the firm will be changed to the Besaw Tire & Rubber Co. The new name is given for C. A. Besaw, president. Directors declare they believe the change will give the firm name wider advertising value. C. A. Besaw, J. C. Harmony, F. E. Schumacher, Hiram Carper, G. E. Munk, Oliver Brumbaugh and M. J. Herr are directors.

Maxwell's Canadian Trade Grows—The representative of the Maxwell Motor Co. in Western Canada, F. W. Wilkins, has just returned to Winnipeg, Man., from an extensive trip in the West, where he closed \$93,848 worth of business for the month of March with prospects for the month of April for double the amount. Business in Western Canada, he declares, is better than what it was a year ago, not alone in the motor car business but in every other line. It shows, he says, the possibility of selling motor cars with the mercury lingering around zero,

which is an absolute assurance that the motor car today is not a luxury but a necessity.

Foundry's Capital Stock Increased—The Campbell, Wyant and Cannons Foundry Co., Muskegon, Mich., has increased its capital stock from \$150,000 to \$400,000.

Standard Truck's Larger Site—The Standard Motor Truck Co., has purchased a tract of land 130 by 160 ft., on Bellevue avenue, Detroit, Mich., adjacent to the property purchased last year. This gives the company a frontage of 250 ft. on the avenue. A new plant is to be erected soon.

Exporting Shock Absorbers—P. H. Webber and Co., Hoopeston, Ill., signed contracts this week with the Cycle Motor Supply Co., of Wellington, New Zealand, to furnish them with W. & C. shock absorbers for 6 months, for exclusive distribution in New Zealand and Australia. This order is directly traceable to the war in Europe.

Used-Cars a Trade Barometer—Some interesting figures have been compiled by George W. Miller, used-car dealer in Seattle, Wash., which throw a new light on his field of operations. It has been found there is upwards of \$1,250,000 tied up in the used cars now being offered in Seattle alone. At first glance this would seem to indicate just cause for worry on the part of dealers, but Miller is inclined to an opposite view and points out that the big majority of his listings are from owners who already own later models, and that there is a fast-growing tendency on the part of those who can afford it to keep up-to-date with the models as they appear each season.

Capital Increase Announced—The M. & S. Gear Co., manufacturer of the M. & S. differentials, has increased its capital stock from \$1,000,000 to \$1,750,000. By June 15 the new plant at Detroit, Mich., is to be ready and it is expected that at least 200 differentials a day will be made. This production is entirely independent from the M. & S. Differentials which are made under special license by the Brown-Lipe-Chapin Co., for the trade in general; the South Bend Gear Co., South Bend, Ind., which makes them for the

Celfor Tool Co., Buchanan, Mich., and the Thomas B. Jeffery Co., which makes them at its plant in Kenosha, Wis., for its own use.

Saxon Places Large Order—The Jacobson Machine Mfg. Co., Warren, Pa., has received a half-million dollar order from the Saxon Motor Co., Detroit, Mich., for 7,500 rear axles and transmission gears.

Motoring Robes in Big Demand—To accommodate an almost unprecedented demand for blankets and motoring robes, the West Bend Woolen Mills, West Bend, Wis., will build a large addition to the factory and power house.

Subsidiary Company Dissolved—The Hub-Mark Rubber Co., Milwaukee, Wis., organized in 1913 as a subsidiary of the United States Rubber Co., has been dissolved as a corporation. The business recently was turned into a direct factory branch of the parent company.

To Manufacture Steering Device—R. R. Hering announced the opening of a factory at Streator, Ill., this week, for the manufacture of a patent steering device for motor cars of which he is the inventor. He is a Chicago man. The Streator Commercial Club is aiding the project.

Capacity Work at Forging Shops—The Obenberger Drop Forge Co., Cudahy, Wis., has enlarged its capital and is building a new shop, 75x100 feet. The plant is operating night and day on the largest volume of orders it has ever known. The company does a large business with motor, car and motor cycle builders.

Stock Issue by Ann Arbor Firm—The Hoover Steel Ball Co., Ann Arbor, Mich., will increase its issued capital stock from \$300,000 to \$450,000. The authorized capital is \$500,000. Stockholders have been notified that 15,000 shares of a par value of \$10 each will be offered for sale and that each shareholder will be permitted to purchase up to 50 per cent of his present holdings.

Property of Streator Co. Under Hammer—Sidney C. Eastman, referee in bankruptcy, is making an effort to wind up the affairs of the Streator Motor Car Co., Streator, Ill. A number of modern buildings, suitable for a manufacturing plant, and 7 acres of land contiguous are among the assets. The improvements cost originally \$75,000. Bids were received by the referee at his office, 907 Monadnock building, Chicago, March 28.

Chassis Company Increases Facilities—The Detroit Chassis Co., catering to the wholesale trade for motor car chassis, has found it necessary to extend its space and also to increase the capitalization of the company. Demands made upon them from foreign countries have forced the company to establish a separate department to take care of this branch of their business, substantial contracts having been made with firms in Holland, Sweden and Japan.

Perkins-Campbell Co. Establishes Branch—The Perkins-Campbell Co., manufacturers of Campbell detachable upholstery and motor car accessories, have decided to establish a branch office, warehouse and salesroom in Chicago and have taken a long-

time lease on the building at 1329 Michigan avenue. The building contains approximately 10,000 square feet of floor space. A shop is to be maintained where Campbell detachable upholstery will be applied to cars.

Michigan Stamping Co. Builds—A new plant 400 by 600 ft., partly one-story and partly two-stories high, is to be erected at Detroit, Mich., by the Michigan Stamping Co., on Mack avenue, near the Lozier plant.

Company Will Make Chemical Trucks—The Luverne Automobile Co., Luverne, Minn., has put on the market a combination chemical, hose and ladder truck weighing 5,000 pounds and selling at \$3,500. It is a six-cylinder motor and wheelbase of 150 inches.

Dissolution of Axle Company—A meeting of the stockholders of the Stone-Probst Axle Co. will be held April 10 at the office of the Seagreaves company, Columbus, O., for the purpose of dissolution and surrendering the charter. The concern has been out of active business for some time.

J. C. Wilson Co. Expands—The J. C. Wilson Co., Detroit, Mich., which recently increased its capital stock from \$20,000 to \$225,000, is offering for sale \$100,000 of its common stock at a par value of \$10 per share. The company makes the Wilson truck and is now preparing for greatly increased production.

A. C. Barber Directs Stephens-Six Sales—A. C. Barber, for many years affiliated with the Moline Plow Co., trade department, has been appointed sales manager for the Stephens-six, the new car which is to be manufactured by the Moline company at the Freeport, Ill., plant. Mr. Barber will have headquarters offices in Moline.

Wisconsin Association Excludes Dealers—The Wisconsin Automobile Business Association, organized two years ago and recently revived after a period of inactivity, has been turned over to garage keepers and henceforth will not include dealers in motor cars among its members. The decision was made when garage keepers of various sections of the city of Milwaukee formed new organizations.

Orders Swamps Paige Factory—The unfilled orders of the Paige-Detroit Motor Car Co., totaled 3,748 cars March 1. The production schedule for the year was announced as approximately 20,000 cars. In spite of these strenuous preparations and a large increase in production, the Paige now faces a shortage in Fairfields, the "Six-46" seven-passenger model, and although the factory is working night and day the unprecedented demand has swamped it.

Midgley Company Discards Old Name—The name of the Midgley Tire & Rubber Co., Lancaster, O., was changed, at a special meeting of the stockholders held recently, to The Lancaster Tire & Rubber Co. At the same time the capital stock of the company was increased from \$550,000 to \$850,000. The \$300,000 increase is 7 per cent cumulative stock. Certain stockholders have already underwritten \$100,000 worth of this. Presses have been purchased and within 60 days the company will be producing in ad-

dition to its present product, wrapped wire-tread and plain-tread tires, full-moulded plain and non-skid tires and a complete line of inner tubes.

New Factory at Goshen, Va.—Thomas O. Nelson, of Fort Wayne, Ind., is in Goshen, Va., to arrange for the opening of a factory for the manufacture of motor car non-skidding devices and a new type of farm implement.

Timken Chemist with New Laboratories—L. F. Miller, who was chief chemist of the Timken-Detroit Axle Co., is head of the Wolverine Laboratories, Detroit, Mich., which were organized to specialize in analysis of iron, steel, nonferrous alloys, oils and coal.

More than 200 representatives of the Chalmers Northwest Co., Minneapolis, Minn., attended a sales convention March 30 and April 1 at Minneapolis. It was the last of a series by the factory company in the United States. Dealers were present from Minnesota and the Dakotas.

New Factory Builds Hearse Bodies—John W. Henney, Jr., Freeport, Ill., will shortly commence the manufacture of hearse bodies for motor cars. He recently resigned his position with the Staver Auto Mfg. Co., Chicago, to take charge of the Freeport plant. The new plant was opened for business April 1.

Larger Willlys-Overland Plant—A new \$700,000 plant is to be erected in St. Paul, Minn., by the Willlys-Overland Co. It will be built west of the Overland assembling plant in the Midway district. The present 4-story building is being used to capacity. The structure, which will be duplicated, has ground dimensions of 200 by 500 feet.

Tractors for Heavy Duty—The Robinson Fire Apparatus Mfg. Co., St. Louis, Mo., will extend its business by installing a heavy-duty tractor truck department. The company during the past year has devoted a great deal of attention to developing tractors and trucks for heavy-duty service. These machines will also be made up for army use in transporting supply trains and as armored cars, those machines having 120-horsepower motors.

Napoleon Co. Begins Production—The recently incorporated Napoleon Auto Mfg. Co., Findlay, O., has elected officers as follows: A. O. George, president; F. P. Diemer and G. M. Donnelly, vice-presidents; O. A. Diemer, secretary and treasurer; C. E. Donnelly, general counsel, and F. M. McGrew, general manager. The company will assemble a 25-horse four-cylinder chassis and will produce a finished car later. Production will begin early in April.

Chalmers Dealers Get Together—A bigger-and-better-business dinner for Colorado Chalmers dealers, held in Denver, March 23, was attended by about thirty dealers from over the state. The affair was arranged by E. J. Johnson, Chalmers distributor for Colorado and adjacent mountain territory, and by Frank B. Willis, general sales manager from the Chalmers factory, for the purpose of promoting greater cooperation throughout the Rocky Mountain



KNOX MOTOR HAULS HEAVY GIRDER—The accompanying illustration depicts the range of usefulness of the hard-worked gasoline motor. The steel girder measured 60 feet in length, 57 inches in width and weighed 15½ tons. A Knox tractor hauled this formidable load a distance of 3.2 miles to its destination in exactly 18 minutes, according to figures supplied by the motor transporta-

tion engineers who contracted for the hauling—E. T. Towar & Co., Detroit, Mich. An interesting incident reported in connection with the trip was that a quick stop had to be made on meeting a street car. The load was brought to a complete stop in a third of its own length although at the time it was under its average speed of 10 miles per hour.

district, improving efficiency of selling methods, display plans and general management of the business.

Overland Will Employ 18,000—As soon as the office building of the Willys-Overland Co. in Toledo, O., is completed, the office force will be increased to 2,000, making the total number of employees 18,000.

L. A. Prince with Anderson Co.—L. A. Prince, formerly proprietor of the Prince Engineering Machine Works, at Sumter, S. C., has joined the Anderson Motor Car Co., Rock Hill, S. C., as superintendent of motor car construction.

Petition for Receiver by Former Manager—Suit for the appointment of a receiver for the Bowling Green Motor Truck Co., Bowling Green, O., has been brought by H. P. Elwood, deposed manager of the concern. He asks for \$6,000 worth of stock which he avers is due him and says the company is insolvent, its debts being given at \$126,000 and assets at \$76,000. Trucks are being made by the company under war contracts at present.

Pierce-Arrow Grants Wage-Increase—An increase of 10 per cent in wages for its employees has been made by the Pierce-Arrow Motor Car Co., Buffalo, N. Y. The

increase dates back to March 3 and includes daily, weekly, monthly and piece-work rates in all departments. The factory was recently closed because of a machinists' strike.

United Truck Outlook Bright—According to an announcement by George P. Sweet, general manager of the United Motor Truck Co., Grand Rapids, Mich., sales of United trucks for February were 119 per cent greater than those for January and for the first 15 days of March, 50 per cent greater than for February.

Distributors have been established in ten cities and a new 5-ton model has been introduced. The plant is running at full capacity and practically the entire output is being consumed in this country.

Chooses Gerlinger Factory Location—Definite announcement was made during the past week by E. E. Gerlinger that the truck factory of the Gerlinger Motor Car Co. will be located in Tacoma, Wash. The production of the Gersix truck will start not later than April 1. The entire energies of the production department for the first 6 months will be devoted to filling war orders. The capacity at the start will be not less than 10 trucks per month. George Peters is the de-

signer of the six-cylinder Gersix trucks and will have charge of the new factory.

Dividends Declared

Detroit, Mich., March 31—The Kelly-Springfield Tire Co. announces a quarterly dividend of 1½ per cent on 6 per cent preferred, payable April 1, to stock at close of business March 18.

Detroit, Mich., March 31—The Hupp Motor Car Corp. has declared a second regular dividend of 1½ per cent on the \$1,500,000 of 7 per cent preferred stock of the company issued last fall. The dividend is payable April first to stockholders of record March 20.

Lansing, Mich., March 31—The Reo Motor Car Co. has declared its regular quarterly cash dividend of 2½ per cent on the common stock, payable April 1, to stockholders of record March 20. The dividend involves a total of \$150,000.

Cleveland, O., March 31—The White Motor Car Co. has declared an initial dividend of 1½ per cent, payable April 8 to holders of record March 25. In connection with the initial dividend of 1½ per cent on the \$16,000,000 stock, it is announced at the office in Cleveland, O., that the stock has been placed on a regular 7-per-cent-per-annum basis.

Newark, N. J.—Day-Elder Motors Co.; general motor car business; capital stock, \$100,000. New York—Inner Spring Tube Tire Co., to manufacture tires, springs, etc.; capital stock, \$100,000.

New York—Advance Auto & Appliance Corp.; capital stock, \$50,000; incorporators, B. D. Flat, A. M. King, E. G. Schietok. New York—Triple Tread Tire Co., to manufacture tires and accessories of all kinds; capital stock, \$50,000.

New York—Moshulu Garage; capital stock, \$1,000; incorporators, A. DeFreitas, E. DeFreitas, J. T. Houlihan.

Newark, N. J.—Acme Garage; to deal in motor cars, etc.; capital stock, \$125,000. New York—Walker Avenue Garage Corp.; motor cars, garages, etc.; capital stock, \$5,000; incorporators, L. G. Mapes, W. D. Howell, M. A. Howell.

New York—Olympic Motor Car Co.; capital stock, \$1,000,000; incorporators, H. H. Waller, G. E. Touloupoulos, M. Friedberg.

New York—Mason Motor Car Co.; to manufacture motors, motor cars, etc.; capital stock, \$30,000; incorporators, N. N. Mason, J. Ward, A. W. Logan.

New York—Hudford Co., to manufacture motor cars, equipment, etc.; capital stock, \$10,000; incorporators, W. C. Hunter, R. Vollbracht, H. A. Demarest.

Oklahoma City, Okla.—Southwest Tire Mfg. Co.; capital stock, \$250,000; incorporators, W. J. McClelland, J. T. Wheatley, John L. McClelland and C. Charles Jones.

Philadelphia, Pa.—Birmingham Motor Speedway Co., to own and operate speedways, race tracks, etc.; capital stock, \$1,000,000; incorporators, H. E. Lattier, N. P. Coffin, C. M. Egner.

Philadelphia, Pa.—Jordan Carburetor Co.; capital stock, \$300,000; incorporators, G. D. Jordan, A. Ayers, F. J. Drake, B. E. Watson, L. F. Jordan.

Philadelphia, Pa.—Motor Tire & Accessories Co.; capital stock, \$75,000; incorporators, W. H. Sponsler, A. H. Sponsler, W. A. Sponsler, Jr.

Portland, Ore.—American Motor Castings Co.; to manufacture and deal in all kinds of castings, machinery, etc.; capital stock, \$200,000.

Queens, N. Y.—Annex Garage & Rental Co.; various kinds of motors, engines, motor cars, etc.; capital stock, \$5,000; incorporators, A. Wolf, J. T. Collin, C. N. Collin.

Rock Island, Ill.—Adams Mfg. Co., to manufacture and deal in motor car accessories and parts; capital stock, \$13,000; incorporators, C. A. Hallgren, W. L. Rudolph and R. L. Hallett.

Saginaw, Mich.—Wizard Automobile Parts Mfg. Co.; capital stock, \$30,000; incorporators, L. J. Weatherwax, H. F. Willis and E. A. Patterson.

Sandusky, O.—Ogontz Motor Co.; capital stock, \$25,000; incorporators, R. H. Collins, V. C. Hubbard.

Sebring, O.—Sebring Motor Co.; capital stock, \$10,000; incorporators, L. R. Coleman, A. J. Stroup, E. M. Hazen, E. B. Erithman, C. V. Coulter.

Seattle, Wash.—Kinnel Motor Vehicle Co.; capital stock, \$10,000; incorporators, Harry Kinnel, F. J. Manley and J. J. Price.

Spokane, Wash.—Culton-Moylan-Reilly Auto Co.; capital stock, \$12,000; incorporators, John Culton, Al Moylan and T. J. Reilly.

South Bend, Ind.—Elkhart Motor Supply Co.; capital stock, \$50,000; incorporators, M. S. Daniels, W. H. Stanley and J. E. Armstrong.

Stevens Point, Wis.—Hay Motor Sales Co., to deal in motor vehicles, repairs, etc.; capital stock, \$1,000; incorporators, Dr. Thomas H. Hay, M. B. Hay, H. H. Hay.

St. Paul, Minn.—Twin City Four Wheel Drive Mfg. Co.; capital stock, \$1,000,000; incorporators, C. W. Kelly, C. W. Guilder.

Recent Incorporations

Detroit, Mich.—York Carburetor Corp.; capital stock, \$60,000; incorporators, Archibald York, L. M. York and William J. Tinney.

Dover, Del.—Sand Creek Oil Co.; capital stock, \$300,000.

Eleva, Wis.—Nicholson Auto Co., to sell and repair motor cars, etc.; capital stock, \$2,500; incorporators, Lawrence Nicholson, C. B. Larson and L. F. Larson.

Erin, O.—Safety Aut-Lite & Mfg. Co., to manufacture accessories; capital stock, \$10,000; incorporators, John F. Karbler, G. E. Dorr, E. L. Braugh, I. G. Stout, C. H. Strohl, C. M. Baker.

Evansville, Ind.—National Auto Supply Co.; capital stock, \$25,000; incorporators, J. F. Frohbieter, B. J. Frohbieter, Anna Frohbieter.

Grand Rapids, Mich.—Miller Auto Sales Co.; capital stock, \$15,000.

Hartford, Conn.—Stamford Auto Service Corp., to sell, purchase and deal in motor cars; capital stock, \$4,000; incorporators, M. A. Shaw, J. Barney Breed, N. J. White.

Indianapolis, Ind.—Union Motor Device Co.; capital stock, \$20,000; incorporators, J. R. Craig, C. W. Coffman and W. C. McNabb.

Joplin, Mo.—New City Garage & Automobile Co.; capital stock, \$4,000; incorporators, R. W. Scott, H. J. Scott and Lou Scott.

Lexington, Ky.—Big Four Taxicab Co.; capital stock, \$300; incorporators, M. H. Davis, A. W. T. Davis and E. R. Aker.

Louisville, Ky.—Alvey Auto Top Co.; capital stock, \$100,000; incorporators, B. H. Alvey, George L. Forman and C. R. Alvey.

Madison, Wis.—Brady-Littlewood Co., to deal in motor cars, operate garage, etc.; capital stock, \$3,200; incorporators, J. A. Brady, W. N. Littlewood, M. G. Meyers and G. H. Pregler.

Memphis, Tenn.—Automobile Sales Co.; capital stock, \$10,000; incorporators, T. H. Dunn, P. P. Kearny, Leo Morlead, C. L. Marsillott and W. C. Chandler.

Milwaukee, Wis.—Badger Auto Body Co.; to manufacture and deal in motor car and vehicle bodies, trimming, etc.; capital stock, \$30,000; incorporators, George Haubert, George E. Garens, John M. Hoerl and W. C. Garens.

Milwaukee, Wis.—Auto Parts & Machinery Co.; capital stock, \$7,500; incorporators, Peter Hott, W. H. Koenig and J. P. Callan.

Madison, Wis.—Moore Oil Co.; capital stock, \$300,000.

Madison, Wis.—Miller Rubber Co.; capital stock, \$1,000,000.

Montgomery, Ala.—Weaver-Henderson Automobile Co., general motor car business; capital stock, \$25,000; incorporators, T. W. Weaver, C. B. Teasley and W. E. Henderson.

Montreal, P. Q.—Overland Tire & Rubber Co.; capital stock, \$50,000; incorporators, J. J. O'Reilly, N. F. MacNeill, W. R. McKay.

Napoleon, O.—Napoleon Auto-Mfg. Co.; capital stock, \$20,000; incorporators, A. C. George, Francis P. Diemer, C. E. Donnelly, F. M. McCrew and O. A. Diemer.

Newark, N. J.—Day-Elder Motors Co.; capital stock, \$100,000; incorporators, Charles P. Day, F. G. Elder, Theodore McMarsh.

Akron, O.—Phoenix Rubber Co.; capital stock, \$125,000; incorporators, J. E. Whigam, J. R. Brown, F. Hopper, A. H. Rash and A. J. Noble.

Aurora, Ill.—Mutual Sales Co., to do a general accessory and garage business; capital stock, \$5,000; incorporators, L. F. Wentzel, W. G. Erickson and W. I. Johnson.

Austin, Tex.—F. L. Shaw Auto Co., to distribute Studebaker cars; capital stock, \$100,000; incorporators, F. L. Shaw, R. S. Fisher and J. H. Willis.

Albany, N. Y.—Creston Auto Service Co.; capital stock, \$1,000.

Albany, N. Y.—Buffalo General Electric Garage; capital stock, \$10,000; incorporators, Edward H. Letchworth, Christopher Saldy, C. R. Stearns, Jr.

Albany, N. Y.—Whiteside & Co., to manufacture motor cars, motors, etc.; capital stock, \$50,000; incorporators, R. W. Schuette, C. F. Novotney and A. A. Meschutt.

Austin, Tex.—Frawley Motor Co.; capital stock, \$10,000; incorporators, J. W. Frawley, G. T. Burgess and E. M. Stapleton and L. S. Skelton.

Cincinnati, O.—Wenstrup-Peerless Garage Co., to operate a garage; capital stock, \$10,000; incorporators, Frank Wenstrup, Edwin Wenstrup, Bertrum Wenstrup, C. A. Backman and L. J. Austing.

Cleveland, O.—Allen Tire & Rubber Co., to deal in tires; capital stock, \$10,000; incorporators, F. J. Allen, W. H. McMorris, J. R. Ackerman, D. L. Shaw, Samuel Wilder.

Cleveland, O.—Mason Tire & Rubber Co.; capital stock, \$475,000.

Cleveland, O.—American Puncture Proof Tire Co.; capital stock, \$10,000; incorporators, John Piontkowski, S. Weiselski, J. Jobionoski and M. Jrojecki.

Cleveland, O.—Brennan & McBride Co., to operate a garage; capital stock, \$5,000; incorporators, J. A. Brennan, A. H. Bramson, E. Ackerman, M. Dworken, S. A. Grossner and T. H. Bramson.

Cleveland, O.—Ohio Hallday Co.; capital stock, \$50,000; Thomas E. Huth, is head of the company.

Cleveland, O.—Bruening Windshield Co.; capital stock, \$5,000; incorporators, J. G. Bruening, F. H. Bruening, H. J. Bruening, J. A. Secunde and G. Bruening.

Canton, O.—Auto Owners Garage Co.; capital stock, \$10,000; incorporators, F. E. Widder, G. F. Ebel and W. H. Cordrey.

Canton, O.—Stark County Motor Car Co.; capital stock, \$25,000; incorporators, A. L. Crowthers, F. L. Fuhr, E. O. Latham, H. T. Schaeffer and Edward Plero.

Chicago, J. M. Kealey Garage; capital stock, \$15,000; incorporators, F. T. Timke, M. V. Kealey and A. L. Bartholomew.

Chicago—Vacuum Motor Mfg. Co., to manufacture and deal in a device to be attached to motors installed in a motor car for the purpose of aiding and assisting the motor; capital stock, \$2,500; incorporators, F. A. Urwan, J. W. Johnson and G. E. Branson.

Chicago—Rogers Automobile Motor Lock Co., to manufacture and deal in motor car parts and supplies; capital stock, \$1,000; incorporators, D. J. McMahon, J. W. Nielsen and A. O. Lambeau.

Chicago—McCarty Auto Co.; capital stock, \$10,000; incorporators, F. C. McCarty, F. V. Wheeler and H. M. Wheeler.

Chicago—Home Mfg. Co. to manufacture and deal in motor cars and other motor vehicles; capital stock, \$38,000; incorporators, B. F. Bartel, L. B. Jacobs and W. F. Heineman.

Chicago—McCarty Auto Co.; capital stock, \$10,000; incorporators, F. C. McCarty, F. V. Wheeler, H. M. Wheeler.

Detroit, Mich.—Shuler Axle Mfg. Co.; capital stock, \$100,000; incorporators, Frank A. Shuler, J. J. Kern, R. H. Dewey.